Journal of the Society of Arts.

FRIDAY, DECEMBER 19, 1862.

INTERNATIONAL EXHIBITION OF 1862.

Her Majesty's Commissioners for the Exhibition of 1862 have addressed the following letter to General Knollys, to be laid before His Royal Highness the Prince of Wales :—

Exhibition Building, South Kensington, December 16.

Sir,—I am directed by her Majesty's Commissioners to request that you will do them the favour to submit to his Royal Highness the Prince of Wales an expression of their sense of the gracious intention, communicated to them in the month of October last, of his Royal Highness's readiness to mark his interest in the success of an enterprise which owed its origin to his illustrious and distinguished father, by distributing, at a State Ceremonial, the prizes which have been awarded by the juries. Such a mark of his Royal Highness's personal interest in the Exhibition would have been highly appreciated by everyone connected with it. Although the number of successful exhibitors would have made it impossible for them individually to receive the rewards of their skill and industry from the hands of his Royal Highness, the value of these rewards would have been greatly enhanced by the fact that his Royal Highness had presided on the occasion of their distribution. It is, therefore, with great regret that her Majesty's Commissioners find, on consulting various competent authorities, that it would be practically impossible, for a single occasion, to carry out their original design of warming and lighting the building. The proposed distribution of the prizes cannot, with due regard to the interests of the foreign commissioners, possibly be postponed beyond the end of January. Under these circumstances, her Majesty's Commissioners have come to the conclusion that they would not be justified in inviting his Royal Highness to preside at a ceremony, the success of which would have to depend in a great measure upon the doubtful chance of a fine day occurring in the depth of winter; neither would they be willing to expose to the probable chance of disappointment from the accidents of rain, snow, or fog, the many distinguished foreigners and British exhibitors who would come from great distances to be present on the occasion. Her Majesty's Commissioners trust that His Royal Highness will not disapprove of the decision at which they have most reluctantly arrived.—I have the honour to be, &c.,

F. R. SANDFORD, Secretary.

Lieut.-General Knollys.

NOTICE TO MEMBERS AND INSTITUTIONS.

Exhibition Catalogues.

Her Majesty's Commissioners for the International Exhibition of 1862 have placed at the disposal of the Council, for distribution to the Members of the Society and Members of the Institutions in Union, copies of the Industrial and Fine Art Catalogues.

Members of the Society desiring to have copies of each of these Catalogues may have them on application, either personally or by an authorised agent, at the Society's House.

Secretaries of Institutions in Union may have a limited number of copies placed at their disposal for distribution amongst their Members, on making a similar application, specifying in all cases the number required.

General Index.

A general Index to the first ten volumes of the *Journal* will shortly be published, which may be bound with the last volume. Members who desire to have copies (which will be supplied *gratis*) are requested to apply to the Secretary as early as possible, in order that a sufficient number may be printed.

EXAMINATIONS, 1863. — NOTICE TO INSTITUTIONS AND LOCAL BOARDS.

The attention of Secretaries of Institutions and Local Educational Boards is specially called to the following extract from the programme of examinations for 1863:—

5. A detailed list of the chairman, secretary, and other members of each Local Board, giving not only their names but their addresses and designations, should be submitted to the Council of the Society of Arts before the 1st of January, 1863. In some cases the Local Educational Boards comprise such large districts, that, for the convenience of the Candidates, Branch Local Boards have to be formed within the districts. Whenever this is the case, the names and addresses of the members, both of District Board and of its Branch Boards must be forwarded to the Secretary of the Society of Arts. All changes in the composition of the various Boards now in existence, or to be formed hereafter, should be immediately notified to the Society of Arts.

THE SOCIETY'S EXAMINATIONS AND GOVERNMENT APPOINTMENTS.

The Council are happy to announce that Mr. John Gershom Greenhough, of the Bradford Mechanics' Institution, who obtained the Prince Consort's prize of twenty-five guineas at the Society's Examinations in May last, has been successful in a recent examination, held by the Civil Service Commissioners, for clerkships in the Privy Council Office, his name standing second in the list of candidates. Mr. Greenhough was nominated to this competition by the Council of the Society, Lord Granville having kindly enabled them to afford him this opportunity of entering the Civil Service.

FIFTH ORDINARY MEETING.

WEDNESDAY, DECEMBER 17, 1862.

The Fifth Ordinary Meeting of the One Hundred and Ninth Session was held on Wednesday, the 17th inst., Sir Thomas Phillips, F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Ell, George	366 & 368, Euston-road, N.W.
Home, D. Milne, (Royal Horse Guards)	Hyde-park Barracks, W.
Jones, James W.	86, Piccadilly, W., and 28, Mark-lane, E.C.
Hewlett, Anthony Hare	Burlington arcade, W.
Klaftenberger, Charles I.	157, Regent-street, W.
Lainson, George	1, Henry-place, Clapham, S.
Macadam, Stevenson, Ph.D.	Edinburgh.
Martin, William Henry	64 & 65, Burlington-arcade, W.
Matthews, Frank, jun.	Driffield, Yorkshire.
Nash, John Tullock	9, St. Stephen's-road, Bayswater, W.
Pease, Joseph Whitwell.	Woodlands, Darlington.
Rosser, S. Egan	Percy Chambers, Northumberland-st., Strand, W.C.
Sands, Thos. C.	7, Bishopgate-street, Leeds.
Tucker, Prof. Raymond	Wellington College, Sandhurst.
Watkins, James	Grammar and Commercial School, Deptford, S.E.
Wiener, Charles	88, Ebury-street, Eaton-square, S.W.
Williams, George Joseph.	17, Cavendish-place, Cavendish-square, W.
Wise, Francis	Chandos Chambers, Buckingham-street, Adelphi, W.C.

AND AS HONORARY CORRESPONDING MEMBERS :—

Dammas, M.	Berlin.
Dietrich, M.	Berlin.
Steffeck, Professor	Berlin.

The following Candidates were balloted for and duly elected members of the Society :—

Attenborough, Richard	Whitley Grove, Reading.
Aubin, Charles	Guardian Works, Great Hampton-street, Wolverhampton.
Baylis, W. H.	69 Judd-street, Brunswick-square, W.C.
Bickley, William	7 Ludgate-street, E.C.
Birnstingl, Louis	230 Regent-street, W.
Bowron, James	Tees Glass Works, Stockton-on-Tees.
Boyd, James	91 New Bond-street, W.
Bradshaw, William	Meadow Iron Works, Mansfield.
Brockwell, Frederic H.	79 & 80 Leather-lane, E.C.
Cochrane, Adam L.	Galashiels, N.B.
Dix, Thomas	10 Amwell-street, Claremont-square, E.C.
Ebrall, Samuel	Canonbury-house, Kingsland, Shropshire.
Fraser, Edward John	26 Craven-st., Strand, W.C.
Frederickson, Johan Frederick	27 Finchley-road, St. John's Wood, N.W.
Godfroy, Edmond	30, Brewer-st., Golden sq. W.
Green, James	35, Upper Thames-st., E.C.
Hack, Thomas	West Middlesex Waterworks, Hammersmith, W.
Hammer, George M.	44, Harrington-street, Hampstead-road, N.W.
Hook, Charles Townsend	Snodland, Kent.
Hudson, Alfred	Cranbrook.
Johnson, Jabez	Pennington Hall, near Manchester.
McLaren, David S.	13, Bute-st., Brompton, S.W.
Scarth, John	96, Westbourne-terrace, W.
Warne, Stannard	4, Bruton-street, Bond-st., W.
Warrington, Wm.	35, Connaught-terrace, W.

The following Institutions have been received into Union since the last announcement:—

Ipswich, Working Men's College.
Sydenham and Forest Hill Institute.

The Paper read was—

ON THE MINES, MINERALS, AND MINERS OF THE UNITED KINGDOM.

BY ROBT. HUNT, F.R.S., KEEPER OF MINING RECORDS, GOVERNMENT SCHOOL OF MINES.

The mineral treasures of the United Kingdom are in every way remarkable. Whether we examine the subject historically, commercially, or from a scientific point of view, it is equally full of that real interest which ever surrounds those things which minister directly to the necessities and luxuries of human existence. For more than two thousand years we have been a mining people. The history of British mining is a remarkable exemplification of the constantly renewing energies of man, applied without any other guiding light than that of undisciplined experience, to the discovery of mineral wealth. It shows us that each age has, in its own particular way, been digging into the earth—that in so digging some knowledge, curious and valuable, has been acquired; and it instructs us further that the miner died—that his experience perished with him—and that the son had to commence where his father began, and that, unfortunately, imbued "by what it works in, like the dyer's hand," he held his acquired knowledge, as too sacred a thing to endure the light, and bequeathed darkness and mystery to his child. In this way we have laboured, producing, from the limited area occupied by the British Isles, a larger amount of metallic wealth than has been yielded by all the world beside. This is due to the industry of the people—to that irrepressible energy, which, like a mighty pulse, has varied in intensity of action, but which has never ceased to beat and quicken the life-labour of England's sons.

Back in those dark days, where the guiding light of History has not penetrated—where we are aided alone by the uncertain flickerings of wild traditions—British mining has its origin. The Tyrian navigator, in all probability, reached these shores, and traded with our forefathers for the tin which was employed in the manufacture of those bronzes which were so prized by the ancient monarchies of the East, and which now are prized as antiquities in our own museums. It is true this is doubted by one of our high authorities. But Sir George Cornewall Lewis, in his "Astronomy of the Ancients," has only opened a door which he has found himself unable to close, and he has left the subject of our commerce with the Phœnicians in a sadly disturbed and most unsatisfactory state. The evidences of mining, by that people whom we usually distinguish as the ancient Britons, it must be admitted, are obscure. I have, however, pursued the enquiry for more than twenty years, and have never lost an opportunity of examining any work, assigned by tradition to the pre-Roman period, and I feel assured of the existence of the rude works of a rude people, to which I can now point as satisfactorily indicating the labours of our British forefathers.

The Roman mines in Cardiganshire, in Shropshire, and some other counties, show us that the followers of Julius Cæsar sought with great industry to render the natural treasures of Britain available for useful ends. The in-

scribed pigs of lead, and ingots of copper, which have been discovered and preserved, acquaint us with this, and prove the Romans to have been not only successful miners but skilful metallurgists. From the departure of the Romans, after their four hundred years of occupation, we have no reliable evidence of the progress of British mining for upwards of five centuries.

It is, however, certain that mining operations must have been prosecuted during this period, as we find the tinners of Cornwall and Devon of sufficient importance to obtain from king John, in the 3rd year of his reign, a charter granting them especial, indeed tyrannical, privileges.

Presuming, it would appear, upon the patronage bestowed on them, they assumed to themselves extraordinary powers. We find a petition to Parliament, in the first year of the reign of Edward I., asking for protection from the incursions of the miner, stating, "The said tinners do daily dig and claim to dig in every species of land, as well in tilled as in other lands, and destroy houses, meadows, and woods, and divide and turn the course of water, running as well to mills as elsewhere, throughout the whole country, to the great destruction and dispersion of the said commonalty."

At a later period several of our monarchs gave every encouragement to mining operations, and Queen Elizabeth persuaded many German miners to come to this country, to whom she granted free right of search for minerals over the most important mining counties. The purpose of that Queen was to introduce a better system of exploration than that which then prevailed. From this period, the progress of our mineral industries is tolerably well defined, and we may record a steady advance in the rate of production, until we find the value of our metals and minerals, exclusive of building stones and clays, to have been in 1861, £34,602,853.*

The thoughts of men, therefore, have been turned to the mineral conditions of these islands for more than two thousand years. In that period the *art* of mining has improved; and the engineering appliances which have been brought to bear upon the ventilation and the draining of mines, are fine examples of mechanical ingenuity. The *science* of mining, however, can scarcely be said to have, as yet, an existence. In 1856, Mr. John Taylor, who must be regarded as a good authority, stated before a committee of the House of Commons, "That there were no greater facilities for ascertaining the productive character of a mine now than formerly. The difference was simply in improved machinery. Our knowledge was not greater than that of our forefathers." Whatever was said in 1856, is true in 1862, and it is a sad reflection that it is so.

When the powers of the mind have been directed to any peculiar set of natural phenomena for a prolonged period, we usually discover in hypotheses advanced, and in theories more or less supported by facts, attempts to explain the causes which have been active in producing the effects observed. There is a curious absence of this in relation to mining. Beyond some very undefined notions that fire played an important part in the formation of minerals, or that mineral veins have some analogy to the veins in the animal body, or the branches of a tree, no hypotheses have been hazarded by miners proper. A few men, educated in the schools of the continent, and two or three professors of science in this country, have, it is true, promulgated their opinions, but until Werner published his theory, they advanced but little beyond the creations of fancy. It will not be without interest to examine the causes of this.

The miner has ever been a distinguishable man amongst the hosts of his brother men. Working in solitude in the dark recesses of the rocks, he has become thoughtful, with only the dreams of ignorance on which to employ his thoughts. Hence he has peopled the subterranean world with "kobals;" and even the smothered sounds of waters dropping in some unopened cave have become to him the realisation of the "knockers"—unkind gnomes, who mock him in his toils, and who as frequently lead him from, as guide him to, the mineral mass on which they are supposed to labour. Habituated to danger, the miner becomes careless of death, and his life is a constant declaration of his belief in fatality. Superstition finds her fitting home in the dark places of the earth, and reigns supreme in the dark mind of an untaught man. Therefore the dominant Powers to the miner have been the creations born of ignorance and night. Signs and tokens, lucky and unlucky days, ill-wishes, evil-eyes, witchcraft and charms, were the rulers of his life.

Although the influences of ordinary school-education have penetrated to the most remote mining districts, and produced the usual humanising effects, yet the miner retains many of the peculiarities which belonged to his forefathers. Whether we examine the miners of Alston-Moor, of the dales of Yorkshire, of North Wales, or of Cardiganshire—the scattered workers of the mines of Shropshire, or the large mining population of Cornwall—we shall discover the same general peculiarities.

As a body, miners may be regarded as a religious class, but, theirs is a religion of the heart, not of the head. They are powerfully swayed by their feelings, to the repression of the influences of reason. Hence the tendency to those impulsive manifestations of a religious conviction which are known as "Revivals." Except, however, where the miners have been brought under the guidance of the Wesleyan Methodists, or of the leaders of some sect who adopts the system of appealing strongly to the passions, their religion is only a superstitious dread of something unseen—unknown. Thoughtful, we have said they are, but their thoughts flow slowly, and they have ever a tendency to dwell on the darker shades of life; while it is with extreme difficulty that they can be brought to communicate their thoughts to others. Miners are rarely frivolous, even *above* ground; they are especially serious *below*. The youngest men will express their dislike of idle conversation or of joking in the mine, while whistling is strictly forbidden. In the sports and pastimes of a mining village there is something peculiarly sober; and the celebration of the annual feast, with its attendant fair, has something of a sombre character about it, in comparison with agricultural revels.

A sanguine temperament may be said to distinguish a miner. He is for ever hoping that stores of mineral wealth are a little in advance of his labour. Therefore, although in relation to the ordinary affairs of life, he is trustworthy, showing a real love for the truth, he is curiously carried away from it when describing the state of a mine, and he expresses his hopes rather than records his knowledge. The exaggerations exhibited in some reports on mines are often of an amusing character, running, indeed, into poetical rhapsodies. Many an unfortunate adventurer has, however, to date his ruin from the day when he gave credence to the hyperbole indulged in.

From their very childhood miners are trained to observe. As boys they are employed to separate the valuable ore from the useless stones with which it is mixed, and this is often a delicate operation. In their labours underground everything depends upon their careful observations, especially in those mines where the system of "Tribute pitches" is adopted; the miner ("tributer," as this class is called) receiving an agreed share of the profit derived from the sale of the ores which he breaks out of the lode. Yet their powers of observation are of a very limited order. Their experience is made up of a knowledge of peculiarities existing within a confined area. So long as these repeat themselves the miner's deductions are correct; but vary the phenomena ever so slightly, and he is at once at fault. This is continually occurring. Within the circle of their labours a few men will probably arrive at a tolerably exact knowledge of the conditions existing, and this knowledge gives them a pre-eminence

* "Mineral Statistics," by Robert Hunt.

amongst their fellow miners as advisers. But remove one of these men from his own locality, he is rarely able to group the new phenomena presented to his view; he feels he is ignorant, though he is rarely so boldly honest as to proclaim it; and he commits himself to statements which are only vague guesses, happy, indeed, if any one of them proves correct.

It is interesting to examine the unmistakeable Celtic manners of the south and west of England, and then those which have a more directly Teutonic origin, of the northern districts. There are differences in the habits of life of the man, but the idiosyncrasies of the miner are the same. This may be due in part to the intermixture which has taken place between the mining races. The German miners who came to England when Elizabeth was queen, settled, some in Cumberland and some in Cornwall. Edward the Black Prince is said to have taken many hundreds of the lead miners of the northern counties to work the rich silver-lead mines of North Devon, and the Cornish miners are allowed the merit of having introduced improved machinery into the mines of Durham and Northumberland. Beyond the similarities which may be traced to this interchange, there are others which clearly belong to the business of mining, and which are probably as old as the days when Job said, "Surely there is a vein for the silver, and a place for the gold, where they fine it. Iron is taken out of the earth, and brass is molten out of the stone."

The psychological influences of subterranean toil form a strange but interesting subject of study. These and the effects of that continued uncertainty as to the reward which labours of the severest kind are to receive, are distinguishingly marked on every miner. In occult powers they are believers; and when, about a century since, the "Divining Rod" was introduced into Cornwall as a means for finding mineral lodes, it was eagerly seized upon, and, to the present day, several families are supposed to possess remarkable powers as diviners, or, as they are commonly called, "dowsers." The most elementary laws of science are still a book sealed to the large majority of miners, and while they are, of all men, themselves the most theoretical, they always meet any attempt to explain phenomena upon the evidences of inductive research, by pronouncing the explanation to be a "theory," which is of no value to a "practical."

We therefore find that the means adoped for determining the value of a mineral district, or of a metalliferous vein, are of the most uncertain character. The task is committed to men who have only their prejudices to guide them. By prejudices we must be understood to signify crude opinions, formed from mere experience—an empirical knowledge of the most imperfect kind. "Without principles, one mining agent recommends a trial to be made, which another rejects as unworthy, consequently, should there be funds at command, and a sufficient period of time allowed to elapse, no portions of the veins or lodes are left untried, and practically, the art of mining has degenerated into a mere try-all system."

The author whom we have quoted (Wallace), himself a miner, continues: "The impossibility of arriving at any knowledge of practical value respecting ore deposits in veins, is avowed by those who, with singular inconsistency, attach the greatest importance to individual experience. Even some occupying high distinction as directors or proprietors of mines, affirm, without qualification, that it is impossible to see through solid rocks; or they summarily dismiss further considerations on the subject, by remarking that the old adage current among miners expresses an important truth, namely:—

It is only by cutting the ground
That the metal is found.

The Cornish miners express their doubts by a similar phrase:—

Where it is—there it is.

If these are not the apologies of indolence and ignorance, they certainly are the utterances of despair."*

It must be admitted that amongst the miners there is an entire absence of any method by which a knowledge may be obtained of the causes leading to the production of mineral deposits. While the speculations of those philosophers who will not endure the toil of subterranean investigations are wild, and consequently valueless.

The natural consequence of this imperfect knowledge is, that all mining operations are necessarily attended with much uncertainty. From time to time a most productive mine is discovered. The Devon Great Consols, first known as Huel Maria, has paid £826 dividends upon every share, one pound only having been paid for shares now worth £490 each. Upon the shares of South Caradon, near Liskeard, the trifling sum of 25s. only was ever paid; the last price of those shares was £390; and £391 profit has been paid on every share.

There are other examples of great success in mining. Such results as these are laid hold of by designing men, and used to bait the hooks by which those who are in a hurry to be rich are to be caught. Permission to search for minerals is obtained from the possessor of the land near to some productive mine. A few trial pits are probably made, and then comes the formation of a company to work "Huel Chance" (or some more attractive name is adopted), through which the lodes from the fortunate neighbour are shown, by the aid of a parallel ruler, to run. Twenty thousand shares is a usual number; but we see 25,000, 30,000, and even 65,000 shares proposed in prospectuses issued to the public. These are offered at £1, at £2, and at £5 per share. By a very ingenious system of puffing, by "reports" obtained from practical miners, by exhibiting specimens of ore—"slocking stones," not always obtained from the mine, the riches of which they are supposed to represent, and by the occasional "wireing" (the cant term for telegraphing) great discoveries which have but little reality—large numbers of those shares are sold. From the nominal capital a deduction of from 20 to 30 per cent, must be made. The speculators on the mining market are of three classes, men with no means whatever, men possessing but very little money, and men with names, who become the promoters or directors of such mines as these for a "consideration." The mine has probably originated with men of one or other of these classes; they obtain their remuneration by exacting from the company when formed, free shares or money, and either one or the other is taken from the nominal capital with which the mine will stand charged. Transactions of this character and sundry enigmatical operations connected with buying and selling of shares, swallow up much more of the subscribed capital; everything is carried on with that easy assurance which deceives the unwary, and the audacity with which false statements are made, often throws the experienced off their guard. The works at the mine, of course, go forward, and a manager is engaged who will report the wonderful prospects of the undertaking. If by accident a discovery of ore is really made, the promoters are soon enriched, and all goes "merry as a marriage bell." If no such accident favours them, they draw largely upon the credulity of their dupes, and, having obtained as much money as possible from them, there is a sudden collapse of the affair.

Such is the character of a number of the mining companies which rise rapidly and perish with equal rapidity. Any system based on misrepresentation must dread the introduction of real knowledge, and, consequently, all those who are concerned in such a system desire that ignorance should prevail, and they sometimes boldly persuade the miners that it is a "folly to be wise."

There is, however, a more satisfactory chapter than this

* "The Laws which Regulate the Deposition of Lead Ore in Veins, illustrated by an Examination of the Geological Structure of the Mining Districts of Alston Moor." By William Wallace. London: Stanford.

in the history of British mining; and after the experience of considerably more than twenty years—with constant attention to the subject—I feel assured that mining, commenced with proper judgment, legitimately carried onward, guided by the advice of experienced miners, and directed by honest intentions, is as satisfactory a speculation as any in which a capitalist can engage. In evidence of this it is pleasing to adduce an instance of the result of undeviating honesty and ordinary caution. Upwards of fifty mining adventures were entered on; these represented a net capital of about £500,000; the mines were worked, exhausted, and abandoned. During the period between their commencement and termination these mines made a profit of upwards of £800,000.

Thus we learn that, notwithstanding the uncertainty which attends all mineral explorations in the present state of our knowledge, adventurers may, by availing themselves of the assistance of men whose judgment has been formed by a careful study of any selected locality, and whose opinions are not biased by improper influences, not merely escape loss, but actually realise a fair profit if their speculations are sufficiently extensive. By this is intended, the advice of an old and successful miner—Never to put all your capital into one mine, but to extend it over many mines.

The question, however, still naturally arises—are there any methods by which may be determined, before commencing operations and expending capital, whether there are metalliferous minerals in the vein it is proposed to explore? By stating briefly a few of the speculations which have been brought forward, it will be seen how curiously men have avoided the labour of investigation, and contented themselves with random guesses. Agricola, the earliest writer on the art of mining, had some clear views on the science of mineralogy in its widest sense. He believed the deposits in the lodes to have taken place from water, but his chemical knowledge did not enable him to understand the process. The dim light thrown by Agricola on the subject soon went out, and at the commencement of the last century fermentation was the favourite hypothesis—*la fermentation dans certains points particuliers de la montagne.* Organisation, or something analogous to vegetable growth, followed upon this—*Les filons puissants en sont les branches principales; les veinules et les filets en sont les rameaux.* (Lechmann.) The time at my disposal will not admit of a detailed examination, with the requisite care, of the evidences which have been brought forward to support the views promulgated from time to time by different writers on the involved problem of metalliferous deposits in veins. Amongst the older writers we find Rösler, Delius, Baumer, Gerhard, and a few others, regarding water as the agent employed by nature to fill the veins with mineral matter.

Becher, Stahl, Henkel, Von Oppel, Hutton, and Playfair suppose those veins to have been formed by the operation of subterranean heat. Hoffman, Zimmerman, and Wallerius, who write with that involved caution, which ever betrays the want of clear views, devise hypotheses which oscillate between fire and water. Amongst modern writers we find Fournet advocating the aqueous theory,* and Bishoff powerfully supporting it, with the addition of chemical forces which appear necessary to the production of the mineralogical phenomena observed. Professor Cotta, who has studied with much care the apparent relations between igneous rocks and ore-veins, assumes that the metals originated in the depths of the earth, and that, under the influence of heat, they have been sublimed, to be deposited in the colder cracks near the surface. Delesse is clearly disposed to refer eruptive rocks and mineral lodes to the same cause, and Amédée Burat follows this path.† The leaning of Deville is also in this direction. Leithart puts forward some vague ideas on electrical action. This writer's subterranean geometry is good, but his physics are sadly at fault. Becquerel records some exceedingly curious experiments, showing that electric currents will produce many of the phenomena observed in mineral deposits. Robert Were Fox has produced miniature veins in clay by the long-continued action of weak voltaic currents. These experiments have been repeated by myself upon a much larger scale than those originally made by Mr. Fox, and the results have been in remarkable confirmation of that gentleman's views. All the more important writers who have dealt with this subject have now been named. Sir Henry de la Beche, who commenced the Geological Survey of the Kingdom, and established the Museum of Practical Geology, showed much interest in the subject, but he can scarcely be regarded as an original investigator in this branch of the science. Mr. W. Jory Henwood has given us a valuable record of facts connected with the mines of Cornwall, and Mr. W. Warington Smyth has admirably described the mineral deposits of Wicklow and of Cardiganshire, but they are silent on the agencies to which they would refer the appearances which they have studied.

Two views, however, which have been variously modified by different writers on geognostical, as distinguished from geological phenomena, prevail. One, represented by Hutton and Playfair, is intimately connected with the igneous hypothesis of the earth's formation; while the other, which may be said to be embodied in the views of Werner, supposes all mineral deposits to have taken place from water.

"Look," says Dr. Hutton, "into the sources of our mineral treasures. Ask the miner from whence has come the metal in his veins. Not from the earth or air above, nor from the strata which the vein traverses; these do not contain an atom of the minerals now considered. There is but one place from whence these minerals may have come—this is the bowels of the earth, the place of power and expansion; the place from whence has proceeded that intense heat by which loose materials have been consolidated into rocks, as well as that enormous force by which the regular strata have been broken and displaced."—*Theory of the Earth*, vol. i. p. 180.

"What I may challenge as my own particular discovery," writes Werner, "is, *a*, to have determined and described in a more particular manner the internal structure of veins, as well as the formation of the different substances of which they are composed, and to have settled the relative age of each; *b*, to have given the most accurate observations and most perfect knowledge of the meetings and intersections of veins, and to have made these observations subservient to the determining their relative ages; *c*, to have determined the different vein formations, particularly metalliferous veins, as well as their age; *d*, to have been the first who entertained the idea that the spaces which veins occupy were filled by precipitations from solutions."—*New Theory of the Formation of Veins: Abraham Gottlob Werner.*

Geological philosophers conceive it to be necessary to start with the hypothesis of a cooling sphere. Without this they believe they are not enabled to account for many of the phenomena which are presented to them in the wide field of their interesting labours. That many rocks bear unmistakeable evidence of an igneous origin cannot be denied. They have been forced by some tremendous subterranean power through the superincumbent strata—they have altered the character of the rocks through which they have passed—they have overflowed at the surface, and spread out upon the sedimentary formations, and their physical structure and chemical composition prove them to have been once fluid or plastic under the influence of heat. Beyond those truly igneous rocks, many of the deep-seated masses forming the earth's crust have been referred to the action of heat. For a long period the Plutonic theory prevailed, and mineral for-

* "Etudes sur les Dépots Métalifères," par M. J. Fournet. Paris: Levrault. 1834.

† "Traité du Gisement et de l'Exploitation des Minéraux Utiles," par M. Amédée Burat. Paris: Langlois et Leclercq.

mations were, without exception, involved within its fiery mantle. Eventually, as the science of geology passed from the regions of speculation into the more trustworthy paths of observation, it was seen that water had played, and is still performing, some most important parts in the Earth's mutations. Consequently the balance now oscillates with a tolerable degree of uniformity between fire and water.

We have only to deal with these views in their relation to metalliferous deposits. The "Mineral Veins" of Mr. Belt* supports the igneous origin of the quartz veins, or "reefs," as they are called, of Australia. He thinks that he perceives in them conditions analogous to the trap dykes—which he had previously studied—intersecting the coal fields of Durham and Northumberland. Mr. Belt says "If we admit the igneous origin of granite, and British geologists at least have admitted it, the conditions under which it must have been intruded and consolidated are those that would also give rents or fissures, and fill them with metallic and mineral substances."

Mr. Wallace, the author of "The Laws which regulate the deposition of Lead Ore in Veins," is of the school of Werner, and he believes that he has determined certain laws regulating the formation of the metalliferous matter in veins. His positions take a most important form, and they should become the subjects of serious consideration to all who are interested in the expenditure of money in mining exploration. He proposes to lead the miner to such a knowledge of natural phenomena, as will enable him to say, from the position of a mineral vein, if it will be worth working. Whether Mr. Wallace's views be adopted or not, we believe there will be but few readers of his book who will not be struck by its logical character. From the 'Introduction' we glean that Mr. Wallace is a practical miner, engaged at the present time in carrying on important mining operations in Cumberland. He tells us "it has not been my lot to obtain the inestimable boon of a literary training;" and, again, he fears "the distraction of thought unavoidably caused by the performance of official duties, necessarily tends to render the style unequal, and the chain of ideas somewhat broken and disconnected, especially upon a difficult subject depending upon long and intricate investigations, carried on in a locality where there is no assistance to be obtained from scientific libraries, or intercourse with scientific men."

We are disposed to think it fortunate that this thoughtful man has been so placed by Providence as to be compelled to look at nature, and read her "sermons in stones," without being brought under the disturbing influences of society.

The work commences with a careful examination of the geology of Alston Moor, which may be regarded as fairly representing the principal district in which deposits of lead occur.

The positions supported may be grouped thus:—

1. That Alston-Moor consists, geologically, of a series of alternating strata of limestone, sandstone, and shale, and one layer of igneous rock.

2. That those strata are penetrated, or pierced through, by a considerable number of fissures, of which by far the greatest number have a main general direction from the north of east to the south of west.

3. There are a few mineral veins which are locally called "cross veins," running nearly north and south.

4. The largest quantity of lead ore has been found in the former, though the latter are not deficient of metalliferous ores; but whether in the former or in the latter, the lead is found in the limestone beds, not in the sandstone or shale. (A few remarkable exceptions occur in this and other lead-producing districts, but the rule is as above stated, clearly pointing to some peculiar condition existing in the limestone rocks, which disposes the sulphide of lead to accumulate in them.)

* *Mineral Veins: an Inquiry into their origin, founded on a study of the Auriferous Quartz Veins of Australia.* By Thomas Belt. London: Weale.

Mr. Wallace is disposed to reject the commonly received idea, that the fissures were formed during the consolidation of the rocks through which they run:—"Sedimentary rocks have been consolidated under the bed of the ocean by immense pressure. A mass of clay consolidated under a pressure of some hundreds of thousands of pounds per square foot is not likely to contain many cracks or fissures." It is admitted that all the enormous masses of rock-formation, included within the Carboniferous series, have been formed in the bed of the Old Red Sandstone ocean, and gradually upheaved to their present position, suffering, during this uplifting, an enormous amount of denudation. "The effect that would be produced by the removal of such pressure from extended sheets of hard rock is well worthy the attention of geologists," says Mr. Wallace, and he then clearly indicates his belief that small cracks or fissures have been formed during the mechanical process of upheaval, and the subsequent one of denudation, relieving the underlying rocks from pressure. These have been gradually enlarged by chemical and mechanical forces until they present their existing appearance. It is not possible for us to follow Mr. Wallace in his clear statement of facts, or to give his reasonings, generally marked by great logical discrimination. Suffice it that we state—and this is enough for our purpose—the general bearings of the views put forth by this industrious and cautious observer. After a most painstaking examination of the contour of the country, and the direction of the water shed, not only at the present time, but as it probably existed during the epoch when the veins were forming, Mr. Wallace deduces his "laws of hydrous agency." It is shown that the accumulation of lead ore in the veins is directly connected with the facilities which were offered by the fissures for the flow of water through them; this water—if we read our author right—being atmospheric, and not, as Werner and some others suppose, oceanic. This water, falling on the surface, charged with oxygen and carbonic acid, is supposed by this hypothesis to derive its mineral matter from the rocks through which it penetrates, and that, subsequently, flowing through the cracks in the rocks—this is deposited as "vein-matter", against the sides, or, as they are called, the "walls of the lode."

Quoting Coleridge, who observes that "the metal, at its height of being, seems a mute prophecy of the coming vegetation, into a mimic semblance of which it crystallises," the author sums up his evidence and makes his deductions. We have followed Mr. Wallace with the most thoughtful attention, and we believe that we shall express the strong features of his hypothesis most clearly by putting it in the following form:—

If it is possible to determine, with any approach to accuracy, the laws which regulated the flow of water through the fissures of any set of rocks, it is possible to predict before working any mineral lode—regarding it as a fissure filled in—whether it is likely to contain metalliferous matter or otherwise, the deposits of metallic ores being dependent on the intensity of force exerted by the aqueous agent, or, in simple language, by the quantity of water flowing through the fissure.

An important addition has been made to our knowledge in the publication, by Mr. Lonsdale Bradley, of Richmond, Yorkshire, of "An Inquiry into the Deposition of Lead Ore in the Mineral Veins of Swaledale."* There is nothing theoretical in this work. A series of sections are given, with sufficient explanations, showing with accuracy the conditions under which a metalliferous condition prevails in the mines of Swaledale.

Mineral veins are either fissures—vast rents—produced by disturbances in the outer crust of the earth, which have been, during the lapse of ages, filled in with matters of various kinds, much of it being metalliferous, or they have resulted from the aggregation of like particles of matter,—which were previously disseminated—during the

* Published by Stanford, Charing-cross.

gradual consolidation of the rocks, forming, at first, slight strings, thin bands, or small concretions. These have given rise to the exercise of crystallogenic force, and thus produced space for the formation of larger deposits.

The last hypothesis considers the mineral veins and the rocks enclosing them to be contemporaneous. The first supposes the rocks to be older than the lodes running through them.

I have rapidly sketched the conditions which exist, at the present time in relation to the mining operations in this country, in especial relation to the amount of knowledge which has been brought to bear on this important subject. I have endeavoured to direct attention to the fact that during a long period of time no advance has been made in our knowledge of the phenomena of mineral deposits; to show how purely speculative have been nearly all the explanations which have been published, in fact, to insist upon the position that empirical knowledge only has been brought to bear on a subject which materially connects itself with the prosperity of the land. I have approached the subject in the most entire independence; I am unbiased by any interest; my desire is purely and simply to aid in the introduction of some system which shall remove mining from that realm of speculation in which it has been suffered to remain.

It is important, in the next place, ere proceeding, to examine the question, Can anything be done?—to see if the value of the product is deserving that attention which is necessary to ensure a more satisfactory result. By the continuous labour of some years I have succeeded in securing for this great mining country a statistical record of our mineral produce, which is not excelled by that of any country in the world. The results for the last three years are shown in the following tables:—

COAL.

NUMBER OF COLLIERIES, AND QUANTITIES AND TOTAL VALUE OF COALS RAISED IN EACH COUNTY IN ENGLAND, WALES, SCOTLAND, AND IRELAND, IN EACH OF THE YEARS 1859, 1860, 1861.

COUNTIES.	NUMBER OF COLLIERIES.			QUANTITIES OF COALS RAISED.		
	1859.	1860.	1861.	1859.	1860.	1861.
ENGLAND.				Tons.	Tons.	Tons.
Northumberland and Durham...	283	283	271	16,001,125	18,244,708	19,144,965
Cumberland	28	28	28	1,041,890	1,171,052	1,255,644
York	383	387	397	8,357,100	9,284,000	9,374,600
Derby	151	153	158	5,050,000	4,940,000	5,116,319
Nottingham	23	21	22			
Leicester	14	14	11		730,000	740,000
Warwick	17	17	16	355,750	545,000	647,000
Stafford and Worcester	549	568	580	6,125,000	7,648,300	7,253,750
Lancashire	381	371	373	10,650,000	11,350,000	12,195,500
Cheshire	35	35	39	700,500	750,500	801,570
Shropshire	59	68	66	765,750	850,500	829,750
Gloucester	60	63	71	4,850,000	5,503,400	6,511,025
Somerset	35	37	40			
Devon	2	2	2			
Total	2,020	2,047	2,074	53,897,115	61,017,460	63,870,123
Wales, North	81	84	78	1,662,000	1,750,500	1,870,250
,, South	362	378	403	6,000,350	6,254,813	6,690,771
Total	443	462	481	7,662,350	8,005,313	8,561,021
Scotland	413	427	424	10,300,000	10,900,500	11,081,000
Ireland	73	73	73	120,300	119,425	123,070
Total for United Kingdom	2,949	3,009	3,052	71,979,765	80,042,698	83,635,214
				ESTIMATED VALUE.		
				£	£	£
				17,994,941	20,010,674	20,908,803

This enormous amount of wealth is annually produced from our rocks by the exercise of human industry. In our collieries, too, a vast amount of merely animal force is employed under the direction of a few individual minds trained to the duties. Method has usually been fairly introduced, and the colliery owner, under the guidance of the viewer, has availed himself of that knowledge which science can only give. The lamentable casualties, however, which are continually recurring, prove that there is yet much to do in the way of instruction; and let me ask is it not in evidence that the great loss of life, which is shown by the colliery inspector's report, amounting to about 1,000 in each

COPPER.

NUMBER OF COPPER MINES, AND QUANTITIES AND TOTAL VALUE OF ORE IN EACH COUNTY OF ENGLAND, WALES AND IRELAND, AND OF FINE COPPER PRODUCED THEREFROM IN EACH OF THE YEARS 1859, 1860, AND 1861.

COUNTIES, &c.	Number of Mines.			Copper Ore.			Fine Copper.		
	1859.	1860.	1861.	1859.	1860.	1861.	1859.	1860.	1861.
England and Wales.				Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cornwall	121	96	97	183,498	182,534	181,594	12,202	12,210	11,663
Devon	10	20	20						
Cumberland and Lancashire	5	6	7	3,225	2,628	2,331	624	184	168
Anglesey	3	2	3	8,386	7,713	8,792	448	416	486
Carnarvon	2	3	5	2,252	2,623	2,079	99	114	109
Cardigan	3	5	2	35	75	67	3	5	5
Montgomery	1	...	1	...	...	115	...	...	8
Isle of Man	1	4	3	35	753	1,485	26	53	93
Cheshire	1	1	1	10,27	227	335	427	155	215
Total for England and Wales	147	137	139	208,021	196,553	196,798	12,829	13,137	12,747
				Estimated Value.					
				£ 1,379,801	£ 1,259,660	£ 1,118,810	£ 1,532,996	£ 1,414,745	£ 1,307,842
Ireland.				Quantities.					
Cork	2	3	4	Tons. 4,536	Tons. 6,466	Tons. 7,350	Tons. 474	Tons. 651	Tons. 780
Tipperary	3	...	...	298	...	...	29	...	...
Waterford	1	1	1	6,090	7,765	6,670	635	756	667
Wicklow*	3	6	3	3,238	4,180	1,641	106	586	27
Clare	1	..	...	96	...	...	4	...	...
Total for Ireland	10	10	8	14,258	18,411	15,661	1,248	1,993	1,474
				Estimated Value.					
				£ 108,171	£ 167,540	£ 141,263	£ 125,215	£ 206,564	£ 151,232
				Quantities.					
Copper ore purchased by private contract from sundry districts not included above	14	23	20	Tons. 14,510†	Tons. 21,732	Tons. 19,028†	Tons. 693	Tons. 838	Tons. 1,110
				Estimated Value.					
	...	...	...	£ 18,863	£ 79,983	£ 104,654	£ 76,489	£ 84,952	£ 113,406
				Total Quantities.					
Total for England, Wales, and Ireland	171	170	167	Tons. 236,789	Tons. 236,696	Tons. 231,487	Tons. 15,770	Tons. 15,968	Tons. 15,331
				Total Estimated Value.					
	...	...	...	£ 1,506,835	£ 1,507,183	£ 1,364,727	£ 1,734,700	£ 1,706,261	£ 1,572,480

* In addition to ese copper ores, some copper is separated from the iron pyrites of Wicklow.

† Including some iron pyrites from which copper is separated.

LEAD.

NUMBER OF LEAD MINES (SELLING ORE), QUANTITIES AND TOTAL VALUE OF ORE RAISED, AND OF METALLIC LEAD PRODUCED THEREFROM IN ENGLAND, WALES, SCOTLAND, AND IRELAND, IN EACH OF THE YEARS 1859, 1860, AND 1861.

COUNTIES.	NUMBER OF MINES.			LEAD ORE.			LEAD.		
	1859.	1860.	1861.	1859.	1860.	1861.	1859.	1860.	1861.
ENGLAND.				Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cornwall	35	38	44	7,842	6,401	6,690	4,985	4,242	4,229
Devon	9	16	11	3,172	3,019	2,762	2,090	2,030	1,791
Cumberland	62	84	79	7,180	7,041	6,324	5,250	5,130	4,614
Durham and Northumberland	30	39	39	19,571	20,200	19,536	14,568	15,186	15,252
Westmoreland	2	6	6	247	362	2,392	125	270	1,576
Cheshire	1	1	1	160	7	106	69	3	25
Derby*	...	...	...	10,929	6,710	7,376	5,853	4,564	5,178
Shropshire	4	4	9	4,062	4,032	4,616	3,008	3,161	3,547
York	13	22	30	9,704	10,665	8,801	6,338	7,099	6,203
Somerset	4	4	4	850	800	860	400	357	330
Stafford	1	1	1	36	115	40	20	75	25
Total for England	161	215	224	63,753	59,352	59,503	42,706	42,117	42,770
WALES.									
Cardigan	23	39	43	7,466	7,355	7,755	5,569	4,952	5,886
Carmarthen	3	3	3	913	781	1,442	637	575	1,000
Denbigh	11	14	14	5,076	6,182	7,647	3,981	4,714	5,498
Flint	26	26	48	4,099	4,947	4,410	3,118	3,767	3,396
Montgomery	12	17	14	2,573	2,136	2,452	1,954	1,592	1,830
Merioneth	2	5	3	303	263	207	196	200	155
Pembroke	...	1	1	...	230	97	...	158	52
Radnor	1	2	2	69	50	37	45	35	23
Caernarvon	4	18	19	157	233	172	120	166	124
Total for Wales	82	145	147	20,656	22,177	24,219	15,620	16,159	17,964
ISLE OF MAN	3	5	5	2,464	2,810	2,717	1,880	2,091	2,043
SCOTLAND.									
Ayr	...	...	1	...	...	1	...	...	¾
Argyle	1	1	1	44	21	39	34	16	29
Kirkcudbright	3	2	2	148	69	115	117	48	84
Lanark	1	1	1	935	1,053	742	656	737	520
Dumfries	1	1	1	750	750	803	500	500	552
Perth	1	1	1	69	80	60	40	57	43
Total for Scotland	7	6	7	1,946	1,973	1,760	1,347	1,358	1,228
IRELAND.									
Louth	1	...	...	20	...	...	14	...	...
Armagh	1	1	1	60	60	45	38	35	29
Clare	2	1	...	57	95	...	38	64	...
Cork	...	...	1	...	...	280	...	...	221
Down	1	1	...	228	168	...	170	128	...
Wicklow	3	2	2	2,047	1,928	1,926	1,332	1,230	1,232
Monaghan	...	...	1	...	...	100	...	...	70
Waterford	2	3	2	40	130	52	29	98	40
Galway	1	1	...	5	11	...	3	7	..
Total for Ireland	11	9	7	2,457	2,392	2,403	1,624	1,562	1,592
SUNDRIES	...	...	...	105	40	55	56	30	37
				91,381	88,744	90,657	63,233	63,317	65,634
Total for United Kingdom	264	380	390	ESTIMATED VALUE.					
				£	£	£	£	£	£
				1,256,641	1,232,063	1,186,249	1,410,095	1,412,760	1,445,255

* The number of Mines in Derbyshire is not known, but the ore is generally obtained from small workings, producing only from a few cwts. to two or three tons per annum.

IRON ORE.

Quantities and Total Value of Iron Ore raised in each county of England and Wales, and in Scotland and Ireland, in each of the years 1859, 1860, and 1861.

COUNTIES.	1859.	1860.	1861.
ENGLAND AND WALES:—	Tons.	Tons.	Tons.
Northumberland and Durham	13,320	12,500	10,750
Cumberland	403,177	468,782	472,195
Lancashire	445,046	520,829	519,180
York, West Riding	175,000	255,700	235,500
,, North ,, ...	1,520,342	1,471,319	1,130,761
Derby	325,500	375,500	396,520
Stafford	1,449,000	1,523,929	1,226,695
Oxford	6,033	5,833	5,600
Buckingham and Northampton	130,058	95,664	113,139
Lincoln	2,000	16,892	33,559
Warwick	30,500	19,500	15,250
Shropshire	197,589	165,500	223,400
Flint, &c....	87,072	85,097	86,500
South Wales	649,758	630,705	545,706
Gloucester	106,292	90,466	100,420
Somerset	29,083	24,102	32,763
Wilts	28,993	76,201	55,779
Hants	9,725	6,119	4,008
Devon	3,598	3,836	5,399
Cornwall	35,213	23,953	26,262
Total for England and Wales	5,647,299	5,872,427	5,239,386
Isle of Man	1,282	1,671	967
Scotland	2,225,000	2,150,000	1,975,000
Ireland	3,000	106	165
	7,876,581	8,024,204	7,215,518
Total for United Kingdom	Total Estimated Value.*		
	£	£	£
	2,507,860	2,466,929	2,302,371

* The estimated value at the place of production.

PIG IRON.

Quantities and total value of pig iron made in each county in England, Wales, and Scotland, in each of the years 1859, 1860, and 1861.

COUNTIES.	Quantities.		
	1859.	1860.	1861.
ENGLAND AND WALES:—	Tons.	Tons.	Tons.
Northumberland	31,500	69,093	73,260
Durham	370,339	340,921	312,030
Cumberland ... }	76,588	87,950	55,165
Lancashire ... }		81,250	109,377
York	301,077	346,765	377,521
Derby	139,250	125,850	129,715
Stafford and Worcester	616,800	616,450	583,350
Shropshire	149,480	145,200	140,791
Flint, &c.	26,980	49,360	46,658
South Wales	985,290	969,025	886,300
Somerset ... }	10,500	1,960	} 17,330
Wilts. ... }		21,875	
Gloucester	31,750	26,458	23,163
Northampton	12,800	7,595	7,730
Total for England and Wales...	2,752,354	2,889,752	2,762,390
Scotland	960,550	937,000	950,000
	3,712,904	3,826,752	3,712,390
Total for United Kingdom ...	Estimated Value.		
	£	£	£
	11,138,712	11,480,256	9,280,975

GOLD.—1861.

During this year, for the first time, Gold, in sufficient quantity to demand a section of our mineral returns, was produced from the Vigra and Clogan Mines, in Merionethshire, to the extent of 2,886 ounces 3 dwts, the value of which was £10,816 17s.

SILVER.

Quantities and Total Value of Silver extracted from Lead Ore raised in each county in England and Wales, and in the Isle of Man, Scotland, and Ireland, in each of the years 1859, 1860, and 1861.

COUNTIES, &c.	1859.	1860.	1861.
ENGLAND:—	Ozs.	Ozs.	Ozs.
Cornwall	215,964	180,757	173,344
Devon	66,875	53,059	45,187
Cumberland	39,406	32,806	37,115
Durham and Northumberland ..	74,222	84,254	78,265
Westmoreland	431	1,695	21,214
Staffordshire	...	...	125
Yorkshire	1,178	3,385	3,650
Shropshire	...	...	1,317
Derbyshire	3,000	...	1,000
Somersetshire	950	850	850
Cheshire	150	45	95
Total for England ...	402,176	356,853	362,162
WALES:—			
Pembroke	...	1,116	400
Cardigan	37,787	44,807	54,989
Carmarthen	1,700	1,310	2,680
Denbigh...	14,318	16,661	20,539
Radnorshire	125	175	...
Flint	22,693	31,092	25,779
Montgomery	6,036	7,665	11,169
Merioneth	962	1,076	988
Carnarvon	480	1,162	990
Total for Wales	84,101	105,064	117,534
Isle of Man	56,974	60,170	67,282
Scotland	4,022	3,140	4,133
Ireland	13,998	14,365	12,398
Sundries	346	277	222
Silver from (Silver Ore)	16,660	8,871	5,799
	578,277	628,740	569,530
Total for United Kingdom	Estimated Value.		
	£	£	£
	158,407	172,903	144,161

ZINC.

Number of Mines in Great Britain, Ireland, and the Isle of Man. Quantity of Ore and Metallic Zinc produced therefrom in each of the years 1859, 1860, and 1861.

COUNTIES, &c.	Number of Mines.			Zinc Ores.		
	1859.	1860.	1861.	1859.	1860.	1861.
				Tons.	Tons.	Tons.
Cornwall	18	19	6	2,423	4,772	5,694
Devon	2	3	1	259	217	51
Derby	*	*	*	1,500	1,470	1,225
Shropshire	1	...	...	66	...	...
Cumberland	3	3	3	660	558	597
Cardigan	7	8	8	2,436	2,230	1,807
North Wales	8	8	8	3,089	2,543	2,250
Isle of Man	1	1	1	2,564	3,181	3,255
Ireland	2	2	2	77	580	890
	42	44	29	13,104	15,551	15,769
Total produce of the United Kingdom, 1861	Metallic Zinc.					
	Tons.	Tons.	Tons.			
	3,697	4,357	4,415			
	Estimated Value.					
	£	£	£			
	75,782	89,536	79,101			

* The number of mines is not known.

year, as the following summary for ten years will show, is chiefly due to the ignorance and consequent obstinacy and recklessness of the working men :—

SUMMARY OF LIVES LOST IN THE COAL MINES OF THE UNITED KINGDOM FOR THE TEN YEARS ENDING 1860.

Years.	Lives Lost.
1851	1,062
1852	671
1853	755
1854	779
1855	728
1856	1,033
1857	1,119
1858	931
1859	904
1860	1,108
Total lives lost...	9,090

The mind of man is only brought under the control of reason by persevering efforts long continued. The soldier is carefully trained to act under the guidance of an individual mind. He is taught to know that his own safety, and that of those with whom he is banded, depends upon implicit obedience to the guiding head, and almost daily drill is found necessary to maintain this discipline. The hosts of miners who have to face death in other and yet more terrible forms, than appear on the battle-field, are left to train themselves to their subterranean toils, and remain untutored to the end in any of those departments of knowledge which would bring their wild impulses under the control of reason, and arm them with the means of avoiding the dangers into which they impetuously rush. I cannot, however, on this occasion venture further upon this. My purpose is rather to deal with the metalliferous mines, minerals, and miners.

I feel assured that in Nature there is no uncertainty; that the mineral veins, with all their apparent irregularity, are as dependent on some fixed law as is the motion of our satellite, and the recurrence of the tides on our shores. The Earth was given to man that he might subdue it, and brute matter, with the physical forces in connection with it, can only be brought under subjection by the influence of mind. No discovery was ever made without great labour. To work and wait is man's destiny, and unless he will bring his industry to bear on any subject, and train himself to patience, the truth will not be disclosed.

To observe correctly requires close and constant training. The senses deceive us, and, unless we are ever on the watch, our minds advance under the influence of imagination more rapidly than is consistent with the mining for truth to which we are compelled to submit. To remove mining, therefore, from the system of guesses, which now rules it, a system of method must be introduced. Education, and education of that character which is peculiarly scientific, is the only means by which we can give greater certainty to the exploration of our metalliferous rocks.

By training young miners to observe correctly, by directing their observation, and compelling them to make an exact note of every fact, however trivial it may at first appear to be, we should obtain a record of conditions which would probably in a little time guide the philosopher towards the laws by which the metals have been deposited as ores in veins. No one can deny, if he has paid any attention to the conditions of the mineral lodes, be they of tin, copper, or lead, that there are evidences of certain constants in the mode of their occurrence. This being acknowledged, why do we not at once organise the method by which more exact information may be obtained? I have been told that the miner will not be educated, and the failure of some mining schools has been brought forward in proof that knowledge is distasteful to the labourers in our mines. I am placed in the very happy position of being enabled to deny the assertion.

TIN.

NUMBER OF MINES, QUANTITY OF ORE RAISED, AND WHITE TIN PRODUCED THEREFROM, IN ENGLAND, IN EACH OF THE YEARS (ENDING 29TH SEPTEMEER) 1859, 1860, AND 1861.

COUNTIES.	Number of Mines.			Tin Ore.			White Tin.		
	1859.	1860.	1861.	1859.	1860.	1861.	1859.	1860.	1861.
				Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cornwall	125	139	144	10,069	10,225	10,725	6,415	6,656	7,016
Devon	3	4	4	111	175	238	82		
	128	143	148	10,180	10,400	10,963	6,497	6,656	7,016
				Estimated Value.					
TOTAL				£ 738,488	£ 812,160	£ 793,698	£ 850,452	£ 866,306	£ 857,706

GENERAL SUMMARY FOR 1861.

Minerals.		Quantity.	Value.
			£
Tin	Tons.	11,640	725,560
Copper	,,	231,487	1,427,215
Lead	,,	90,696	1,136,249
Silver Ore	,,	29	1,471
Zinc Ore	,,	15,770	31,113
Pyrites	,,	125,135	79,715
Arsenic	,,	1,450	10,875
Nickel	Cwts.	16	24
Wolfram	Tons.	8	29
Antimony	,,	15	45
Manganese	,,	925	2,925
Sundries—Gossan, Ochre, &c.	,,	3,016	3,016
Iron Ore	,,	7,215,518	2,302,371
Coals (sold and used)	,,	83,635,214	20,908,803
Other Minerals	,,	2,222,602	880,114
Total Value of the Minerals produced in 1861...			£27,509,525

METALS PRODUCED FROM BRITISH MINERALS.

		Quantity.	Value.
Gold	Oz.	2,784	10,816
Tin	Tons.	7,450	910,762
Copper	,,	15,331	1,572,480
Lead	,,	65,643	1,445,255
Silver	Oz.	569,530	144,161
Zinc	Tons.	4,415	79,101
Iron, Pig	,,	3,712,390	9,280,975
Total Value of the above			13,443,550
Estimated Value of other Metals			250,500
Coals			20,908,803
Total Value of the Metals produced, and Coals...			£34,602,853

Schools for miners were established at such a distance from the mines and the miners' homes, that it was impossible for the man who had laboured eight hours in the dark recesses of the earth, and toiled for an hour on perpendicular ladders in climbing to the surface, to attend the school. The effort, it appeared to me, should be made, seeing that the miner could not go to the school, to take the school to the miner. I have worked to this end, and organised the Miners' Association of Cornwall and Devonshire. With very limited subscriptions from the mineral proprietors and from others connected with the mines, ten classes have been established in as many mining centres. In these classes are taught, by qualified teachers, chemistry, mineralogy, mechanics, surveying, and mechanical drawing. Each of these classes is well attended by working miners, and the applications made to the Council of the Miners' Association to establish yet other classes in other districts are urgent, and, unfortunately, at present beyond the means at their disposal.

That we have to contend with the prejudices of the older miners is certain. We have, however, passed through the period of active opposition, though still we have to combat the silent repressory efforts of those whose game is speculation, and whose living depends on the uncertainty of ignorance. These must fail before that steady perseverance in a good cause, which will, I believe, distinguish the progress of the Miners' Association. So far as the experiment has been carried, it has proved a success. A most earnest desire has been manifested by the young miners to learn those branches of science which it is thought right to introduce in the classes. The utmost care is taken to avoid in every way any interference with the labours of the miner; he is only taught those sciences which are directly available to his bread-getting, and only so much of these, as appears necessary to the proper training of the miner's mind.

Experience has proved that it does not do to force knowledge of any kind on the untrained mind. It is rejected if the attempt is made, consequently the Miners' Association, having prepared its machinery, waits the invitation of those for whose benefit it is intended; and no teacher is sent into a district until a class of not less than ten members is formed, and these members agree to subscribe to the general fund. The subscriptions are small—five shillings a-year from the working miner, and not less than ten shillings a-year from the mine agent or manager. In addition to the system of class instruction, periodical meetings are held for the purpose of reading communications from the miners on the several subjects connected with the conditions of, and the working of, the mines, the mechanical appliances necessary, and the modes of preparing the ores for the market. In this way it is hoped, by slow but sure degrees, to introduce an improved system into a district where, with the tenacity of the ancient Celt, they still cling to the practices of their fathers.

That which has been done, which is now doing in Cornwall and Devonshire, may be done elsewhere. We have, it is true, mining schools at Glasgow, at Wigan, and at Bristol. I am only personally acquainted with the school at Glasgow, which progresses in a most satisfactory manner. But what are these amidst the masses of miners spread over the length and breadth of our islands. Let us examine, with as much correctness as we can, the conditions which exist.

In Great Britain there are				
Coal Mines ...	3,000	employing	250,000	persons.
Iron Mines... ...	uncertain	,,	27,000	,,
Copper Mines ...	167	,,	22,000	,,
Tin Mines ...	148	,,	14,500	,,
Lead Mines ...	390	,,	21,500	,,
Zinc and others...	—	,,	1,000	,,
Making a total of			336,000	persons

actually engaged in mining operations: this is exclusive of quarries of all kinds.

Out of this 300,000 there certainly are not more than 300 under any such course of instruction as is necessary to fit them properly for the labours to which they are destined. We boast of our educational progress. We teach reading and writing in every, the remotest, corner of the land, and there we stop. We instruct our children in a knowledge of the signs by which ideas are expressed, but we leave them to gather ideas by any accidental means which may present themselves. We put tools into the hands, but we trust to chance for a knowledge of the way to use them.

I do not think it necessary to discuss further the question of the worth of knowledge to the working man. The unfortunate evidence which is constantly recurring of the loss of life in our collieries and mines, convicts us all, as a people, of great carelessness. The pyramids of Egypt were built by mere brute force controlled by a despot's hand, and guided by some master mind. Some of our vast engineering works, our railway tunnels and our railway cuttings, have been executed under the same circumstances. We have gone on trying the experiment in our mining operations, and every accident proclaims that the system does not answer. If we would save life we must educate the living in the causes of danger, and teach them the means by which these may be guarded against. The ventilation of a colliery may be the best possible, the truest science may have been brought to bear on the problem, and in obedience to exact laws, everything may have been arranged. Then, having taken all this care, having expended all this thought, time, and money, we leave it to the mercy of any individual man, out of many hundreds of ignorant men, who through their very ignorance are thoughtless, reckless.

Again, hundreds of thousands of pounds are expended annually in the exploration of our mineral districts. There is a rare—a tempting—supply of minerals in these islands. We have gold and silver, copper, lead, tin, zinc, antimony, nickel, cobalt, bismuth, uranium, chromium, and other of the rare metallic minerals, not to mention our vast stores of iron; coal beds, which are enormous, but which we are wilfully wasting, and earthy minerals of great value. The hoarded treasures are mined for by men who burrow, as does the mole, without any guiding light. The result is that mining for metallic minerals is not, on the whole, remunerative, whereas it is the expressed opinion of men whose experience entitles them to attention, and whose utterances are the result of careful thought, that no industry should yield so fair a profit if prosecuted with judgment, and carried forward with the necessary knowledge and consequent economy. It may be asked what can be done to remedy the evils which I have described? The one only remedy is a correct, a fitting education. By this I mean instruction in such truths as will serve as guiding and as warning lights. I do not dream of making miners men of science—I would avoid that superfluous knowledge which does tend, in poor, fallible human nature, to generate conceit. I would not attempt to teach mining in a school. The only school in which mining can be taught is the mine itself; but I would bring in aid of that practical teaching on which we must insist, those aids which have been afforded by the investigations of true science. At a small cost, in each mining district, schools might be cheaply established, and the means afforded for the acquirement of that modicum of knowledge which is really required. If desired, in well-selected centres, a yet higher class instruction might be given to those who had shown they had the industry and ability to deserve those larger advantages. From these, again, might be gleaned the more remarkable young men, and to them might be offered the full scientific education which is afforded by such an establishment as the Royal School of Mines.

A commission has been, during the year, most industriously at work, inquiring into the conditions of our metalliferous mines and the health of our miners. We must wait for their report, which (appear when it may)

will be a most important record of facts. Whatever may be the advice of the commission to the Government, of this I am assured:—That money will continue to be squandered in lavish expenditure on mines that are unworthy of trial; that wealth will be wasted through the errors of ignorance; that dreadful casualties will continue to horrify us; and that the miner will perish ere yet he has reached the number of his days; until we have crushed out that dark ignorance which spreads over all like a fungus, and have planted in its place some of the seeds from the tree of knowledge.

DISCUSSION.

The CHAIRMAN said he had now to invite gentlemen present to add to the interest of the valuable paper which Mr. Hunt had read, by entering into a discussion of some at least of the various important topics which had been brought under their notice. Mr. Hunt had directed their attention to a variety of subjects, and he (the Chairman) would shortly glance (for it happened that he had some practical acquaintance with mining) at one or two of those topics. The first was the importance of the subject. When they were told that the annual produce of the mines of this country amounted to between thirty-four and thirty-five millions sterling, it was impossible to over-estimate the importance of the question itself. In the next place Mr. Hunt had adverted to the uncertainty attending mining operations; he (the Chairman), however, thought that Mr. Hunt was too sanguine in his anticipations as to the power that might, at some future time, be acquired of ascertaining beforehand the nature and extent of the mineral deposits in a particular locality, and that there always must be a great amount of uncertainty. He did not mean to convey that Mr. Hunt was not right in saying that that uncertainty might be considerably reduced; but it was the fact that the mining treasures were in the very depths of the earth—that they varied from point to point even in the same vein — and that their value, though it might be approximately guessed, could not with certainty be ascertained. Still, however, that did not militate against the advice Mr. Hunt had given that science should be applied as far as possible, in lessening the uncertainty of mining operations. Mr. Hunt had also directed their attention to a subject the most important of all—that was the insecurity of life in the pursuits of mining. That insecurity arose, as they knew, chiefly if not entirely, from those explosions which occurred in collieries from what was known amongst miners as fire-damp. A few years ago they thought they had obtained security from the accidents produced by fire-damp, through the invention, by Sir Humphrey Davy, or George Stephenson—whichever was entitled to the merit, and, no doubt, both were entitled to a large amount of it—of the safety lamp. But the fact was, the loss of life had been much more considerable since the use of the safety lamp than before its introduction; and it appeared from the tables Mr. Hunt had laid before them, that the loss during the last five years had been more than in the five years previous to that time, the proportion being as 5,000 to 4,000. He did not, of course, mean to say anything so absurd as that the use of the safety lamp had increased the risk of the operatives. No doubt it had increased the power of man to work mines which could not otherwise be worked. It had in that sense, however, increased the danger, because it had strengthened the disposition of men to meet perils which had deterred them before the safety lamp was invented. It was most deplorable, and he had witnessed it sometimes himself, the extent to which human life was sacrificed in the working of mines; and though he trusted Mr. Hunt was correct in saying that with increased knowledge and increased prudence and caution they should be able much to diminish that waste of life, yet, there were elements which rendered it difficult to hope that they should ever escape without some considerable casualties in the prosecution of these operations. Still, with increased scientific knowledge and training, they might hope, at no distant time, to be enabled much to lessen this insecurity, and to afford additional safety to a very faithful, hard-working, and valuable race of men. He regretted that he was compelled, by an unavoidable engagement, to leave the chair, but his friend Mr. Hawes had kindly consented to take his place, and would preside over the discussion, which he hoped would be as interesting as the paper itself had been.

The chair having been taken by Mr. Wm. HAWES, Vice-president,

Professor TENNANT said he fully agreed with Mr. Hunt in many of his statements, and he regretted to hear that there were only about 300 persons attending the mining schools out of the large number of the population employed in that industry. He was in hopes, from the great interest that Mr. Hunt had taken in promoting the education of the miner, both in Cornwall and Devon, he would have had in those two counties a considerably larger attendance at the schools he had established than was stated to be the case. He (Professor Tennant) had had the pleasure of lecturing before the Bristol School of Mines, which had been carried out with so much assiduity by Mr. Herbert Mackworth, and there he found a very useful work was being done. As to the usefulness of a knowledge of mineralogy there could be no question. About 500 minerals had already been described, and more than half that number were found in the British Isles; and to those who emigrated to our colonies, an acquaintance with these substances would be most valuable, for more than 450 of those minerals were to be found in our various colonies. Let them reflect for a moment what had been done with regard to our colonies in the last ten years. In the recent Exhibition proof was given of their vast mineral wealth, in the remarkable specimens that were shown of gold, silver, copper, precious stones, and many other substances, which it would be too tedious to enumerate. Many of these substances were discovered by the working miners who were sent out from this country. Specimens from the colonies were brought to him almost every day; and when a man of intelligence came to him, he (Professor Tennant) would throw down some minerals on the table and ask him if he ever met with them in the colony where he had been. The reply was, "Sometimes I do." "What do you do with them?" "Oh! they are not worth collecting." To which he replied, "The gold you collect is worth £4 per ounce; but these rough stones you reject are worth £50 per ounce, and, if of higher quality, they are worth £500 per ounce. They are diamonds." He believed that in many of these colonies they were throwing these things away. To come back to the mining districts of this country. It was to be regretted that much ignorance on this subject prevailed at the present day. He had, when visiting these districts, made inquiries of the captains of mines as to their knowledge of the most common substances, and they called them all "mundic;" but those substances were various in their composition. One was copper, and another iron, "mundic," but the miner could not distinguish one from the other, though a little knowledge of the use of the blow-pipe, which should be taught in all educational establishments in the provinces — especially in the mining districts — would enable those persons to distinguish one substance from another, more especially the metallic minerals. Professor Tennant then referred to various attempts to establish mining schools in Devonshire and other districts by Mr. Prideux and others. Sir Charles Lemon endeavoured, in 1838, to establish mining schools in Cornwall, and made the liberal offer of £10,000, upon condition that the people of the district subscribed a similar sum, but that was also given up. He believed the mineral wealth of this country might be greatly enhanced by the carrying out of the schools which Mr. Hunt had suggested, and he hoped those interested in the subject would second

that gentleman's views, as he was sure it would result in economy to those who embarked their capital in mining operations. People were attracted by the glowing accounts published of mines, and were induced to take shares, and they frequently found, in the place of dividends, they were asked to pay a succession of calls. There were persons who invested a large amount of capital in mining speculations, who would not take the trouble first of all to see for themselves whether such a mine actually existed, and, in the next place, whether the specimens exhibited were actually taken from that mine, for these were often obtained from other sources.

MR. ROBERT RAWLINSON could not speak upon this question as a practical miner, but merely as having paid general attention to the subject. He wished to express, for himself individually, the great gratification it had given him to hear the interesting paper of Mr. Hunt, which he thought was not more eloquently expressed than soundly philosophical. The remarks as to the ignorance of the miner, he was sorry to say, applied to every district he had visited. Wherever he had to deal with these men, he was met by the ignorance and apathy which were the offsprings of the want of education. He thought, therefore, this question could not be too much urged, and the only source from which national education could spring was the Government of the nation. It was they who must take this question up. With regard to the pecuniary losses incurred in mining speculations, he would state that some years ago, whilst holding an official inquiry in Cornwall, he was brought into connection with several of the large mining adventurers of that district, and they stated it as their opinion that, if the value of all the ore mines in Cornwall, and the cost of working them were compared, the statement would stand as something like 25s. paid for every pound's worth of ore obtained. It was a serious reflection upon them as a nation that unprincipled speculators should come in and entice the public to their ruin without there being some means of protection from such frauds. The geological portion of the question was one too large for him to enter upon at this time; but he would remark that from the observations of Mr. Hunt he could see a glimmering of the light which he believed would be ultimately thrown upon the subject of the metallic formations of the earth. He was himself inclined to agree with the aqueous theory—infiltration and deposit by means of water into veins, rather than with the theory that all minerals had been fused into the veins by the action of heat. Reverting to the proverbial ignorance which prevailed amongst the great body of the mining population, Mr. Rawlinson remarked that the existence of "diviners," or "dowsers," for finding out the mineral lodes was a serious reflection upon the present age; and yet it was a curious fact, that a French adventurer, who was supposed to have been successful in finding water beds in Africa, was introduced to the government during the Crimean war, and was sent out to trace, by the divining rod, water in that locality. He fully endorsed the opinion expressed by Mr. Hunt, that it was time they woke up as a nation, and urged upon the government not to expend money upon education extravagantly, but to realise the idea that the most extravagant thing they had to contend with was ignorance, and the sooner it was eradicated the better.

MR. JAMES HOLLOW said, having been associated with Mr. Hunt in the formation of Schools of Mining in the West of England, he would express his opinion that they could be carried to a successful result. He fully concurred in the remark that after eight hours' labour in the recesses of the earth the mind was little disposed to walk a long distance to school; but that would be obviated by Mr. Hunt's suggestion to bring the schools to the miner, and, as a resident amongst that class, he was able to state they were only too glad to have the means of education brought within their reach. He was satisfied, when these schools were more widely extended, the ignorance which prevailed in the West of England would be dispelled, and the people would be led to a greater degree of research for the development of the metallic resources of the country. He would express his regret that Mr. Hunt had not given them a little more of his own views with regard to the theory of the formation of the metallic veins, upon which, from his large acquaintance with the subject, he was qualified to afford them some valuable information. As a resident amongst miners, he begged to say a word in their defence. He did not think they were altogether the ignorant and gloomy class which Mr. Hunt had designated them. He found them generally cheerful and lively above ground, whatever they might be in the solitude of the mines; and he could bear personal testimony to the fact that their feasts and social gatherings were as lively demonstrations of festive enjoyment as one could wish to witness, and were maintained with as much spirit as amongst the labouring population in any other part of the kingdom.

MR. ROBERT HUNT said one or two remarks had been made on which he would say a few words, lest he should be misunderstoood. In the first instance he would refer to the remark of Sir Thomas Phillips, to the effect that he believed that uncertainty must through all time attend the exploration of rocks, simply because the minerals were buried within the depths of those rocks. Now, they did know, by the aid of experience, that there were certain laws in obedience to which the minerals were deposited. There were laws of direction, which were not without their exceptions, but they knew that where there was a deviation from one particular direction to another, there was a change in the character of the lode; and they also knew that there were certain rock conditions—as they might be called—prevailing. He would not advise any friend of his to adventure much money in a mine situated at any great distance from the junction of two dissimilar rocks in Cornwall. There appeared to be in nature a necessity for such a condition, and not merely did this prevail in the primary rocks of Cornwall and Devon, but they found the same set of conditions in the limestone or lead districts of the northern counties and elsewhere. Now they had, by experience, arrived at the indication of two or three laws by which they might be guided. They lived upon an earth which was not now in the condition in which it left the hands of its Maker. It had been subjected to vast disturbances, and those disturbances had interfered with the great general laws by which the larger phenomena had been regulated. Those disturbances would appear as exceptions to the general laws, and where sufficient inquiry was not made, these exceptions would appear as contradictions. What he required of the miners—what he hoped to see amongst them was, a careful record kept in every mine of all the variable conditions which presented themselves to the miner as he worked the lode; the variations of the rock through which he was working, the variation as regarded the direction of the lode and its underlie or dip, and numerous other points, all of which would lead eventually to the knowledge of some one great truth. No doubt, as in meteorology, they had had to wait long years before they had been made acquainted with the fact that the winds were not after all so uncertain as the old proverb declared them to be. Therefore, he was quite disposed to think they must not, with their excellent Chairman (Sir Thos. Phillips), suppose that there must ever remain that uncertainty, because there was uncertainty now. But he did believe that by a proper system of education amongst the young working miners, by leading them to record their observations, that, if the present generation did not, future generations might arrive at such truth regarding mineral deposits as might enable them to determine, while standing upon the surface of the earth, whether it was worth while to expend thousands of pounds in working it for any particular mineral lode. His friend Mr. Tennant made a remark with regard to the Cornish miners which compelled him (Mr. Hunt) to stand up in their defence. They were, he must say,

about his oldest and best friends, and he must not have them placed on too low a scale, although Mr. Hollow had said he had, in his paper, rather depreciated the character of the Cornish mine this evening. Mr. Tennant had mentioned that the mine agents were in the habit of confusing that common substance, "mundic," which was an iron pyrites, with common copper ores. Now, of the ordinary minerals, the varieties of tin and copper ores, and of lead and zinc, miners had gained by experience a very perfect and strictly discriminating knowledge; but when they came to the rarer minerals, from want of experience they were at fault; and in many instances this ignorance gave rise to a considerable amount of waste. He believed, as he had stated again and again, that a certain amount of chemical knowledge would lead the Cornish miner to an acquaintance with facts which were not clear to him now; particularly that the ores now lost, and known under the generic name of "gozans," which were peroxydes of iron accumulating upon the backs or upper parts of the lode, frequently contained considerable quantities of silver. Copper ores were known many of them to contain silver, though, at the present time, this was usually lost to the miner; and he might mention a number of instances in which the advantages of a chemical knowledge would be at once evident. With regard to the Mining Schools established, to which Mr. Tennant had alluded, the first of them in Cornwall was started by Sir Charles Lemon, who made to the county the liberal offer—not of £10,000, but of a piece of freehold ground upon which to build the college, £500 towards the building, and the sum of £30,000 to endow it, on condition that the mining adventurers of Cornwall would allow of the imposition of a tax of one farthing per ton upon all the ores raised in the county. That offer was rejected. Sir Charles Lemon, nevertheless, carried on the school for three years at his own cost, having there Professor Moseley, Mr. John Prideux, and Mr. Dickenson (the Colliery Inspector), as teachers in the several departments; but not finding the support he had expected from other gentlemen of the county, he allowed the school, after three years, to die away. It was subsequently taken up by the Royal Institution of Truro, and tried for a further period, but did not succeed, because the miners could not go the distance to the school; although Truro was the centre of Cornwall, the having to go eight or ten miles prevented the miners availing themselves of the advantages which the school offered. A third attempt was made with no better success. It then occurred to him to try the experiment of taking the school to the miners. By dint of industry and perseverance, subscriptions were obtained which did not exceed £300 a year, and with that sum two well-qualified teachers were paid, together with their travelling expenses, and certain classes had been furnished with chemical apparatus and all the materials necessary for assaying; and, as he had stated in his paper, they had now in operation between Tavistock and St. Just, in Cornwall, ten classes. He must say, in honour of the Cornish men, that greater aptitude for acquiring scientific knowledge he never met with in any men with whom he had been brought in contact. The amount of knowledge acquired by those working men, after a few weeks' study under the chemical teacher, Mr. Pearce, had been surprising, and the interest with which they pursued their studies was worthy of the highest commendation. If they could increase the amount subscribed in support of these schools, he was satisfied there would not be a district of western England without its mining school. The success of the Miners' Association was now established, and there was a great desire to receive the instruction which the Association offered—that was a knowledge of chemistry, mineralogy, mechanics, and those branches of physics which were immediately connected with the operations of pumping, ventilation, and the like. He believed he was not too sanguine in predicting that this would be found to tell most materially on the mining interests of the county of Cornwall. He had been charged with denying to the Cornish miner cheerfulness, but this he did not intend. If his words conveyed that idea he begged to correct it. What he meant to say was that there was a sort of subdued religious feeling imbuing the miner's mind. There was not that boisterous animal hilarity which was found amongst the working classes of agricultural populations. There was more deep thought, of its own peculiar character. They did not fail in cheerfulness, and as far as the other qualifications of the men were concerned he was proud to say the Cornish miner, even the most uneducated, might take a very high rank amongst the best of the working men in any portion of the United Kingdom.

The CHAIRMAN (Mr. W. Hawes) said it was *now his* pleasing duty to call upon this meeting to pass the usual vote of thanks to the gentleman who had favoured them with a paper this evening of unusual interest and merit. It was impossible at that hour for him to follow, with anything like detail, the whole course of that paper; but there were one or two points on which he would say a few words. In the first place, he thought they had built a great deal too much upon the ignorance, both of the miners of Cornwall and the working classes in general. It was a mistake which was very often made by a large majority of persons who found fault with the working classes for what they called their ignorance in this or that subject, whereas, looking at all the circumstances of their lives—looking to their education and the circumstances of their earlier and later life, they ought rather to praise them for the amount of information and industry they possessed, rather than to find fault with them for not coming up to a particular standard of education. He was himself rather disposed to praise the workman for what he did know, then to find fault with him for what he did not know. And he thought that was the right way of estimating the position and knowledge of the working man. Observing what had been done in the mining districts without scientific instruction, they would doubtless find that, with the addition of a little scientific knowledge, the miners would be able to prosecute the difficult operations in which they were engaged in so improved a manner as to show they had benefited by that knowledge. They had been told that a very large portion of the mining of this country was unsuccessful and unproductive. Statistics had been placed before them, from which it appeared that about 350,000 persons were employed in the production of minerals, to the value of nearly thirty-five millions sterling per annum, which gave as the production of each miner not more than about £2 per week, an amount so small that they could hardly conceive it possible that it would remunerate the large capital which was invested in these mines. He thought that was sufficient to make anybody tremble at mining operations unless they were backed by that skill and certainty of success which had been spoken of by Mr. Hunt. One word as to what were called the fixed laws of Nature and guesses as to mining. He thought it was difficult for them, with their present knowledge, to ascertain the fixed laws of Nature in the disposition of metalliferous veins through the various strata which encompassed this globe. He thought it must always be to a certain extent a matter of guess, but they must endeavour that their guess should be directed by the best information that could be obtained, and that could only be arrived at by practical experience, combined with a knowledge of the geological structure of the crust of the earth. Referring to the lamentable loss of life connected with mining, if they took the value of the coal raised and then looked at the average annual loss of 1,000 lives, it was marvellous to think that the attention of the country should have been directed to so important a subject in so slight a way. Only within the last few years had they had any parliamentary check whatever upon the mode of employment of the people engaged in these dangerous undertakings. All they could do was now being done. There was a more efficient superintendence—and

they could ask for nothing more than this; but he hoped they should ultimately have a system whereby unnecessary dangers would be reported and exposed, so that those who were employed in these operations might be prohibited to the utmost limit by legislative interference or by obligations imposed upon the owners of the collieries. Mr. Hawes concluded by moving a cordial vote of thanks to Mr. Hunt for his valuable paper.

The vote of thanks having been passed,

The Secretary announced that the next Ordinary Meeting would be held on Wednesday, the 14th January, when a paper by Mr. Samuel Highley, F.G.S., F.C.S., "On Photography and the Magic Lantern, Educationally considered," would be read. This paper will be illustrated by the Oxy-hydrogen Lantern.

THE INTERNATIONAL EXHIBITION AND FRENCH MANUFACTURES.

The Paris correspondent of the *Times* says:—

"The Paris manufacturers of bronze ornaments have returned from the London Exhibition with orders so numerous that, after having engaged all the unemployed artists and mechanics, they have found it necessary to prolong the ordinary period of work by three hours a day. The increased demand for gold and silver gilt ornaments, fine porcelain, and printed stuffs for export to Belgium, Holland, Spain, Italy, Portugal, and South America has given much impulse to all these trades. The International Exhibition has conferred immense benefit not only on the manufacturers of bronze articles, but likewise on French gunmakers, who at present export arms to the amount of 10,000,000f. annually. The Parisian shoemakers say that the English beat them in the manufacture of men's boots and shoes. It would be vain for them to deny the fact, for there are several shops in Paris established for the sale of men's boots and shoes of English manufacture. The Parisians, on the other hand, boast that none can compete with them in the manufacture of ladies' boots and shoes. They add that they export an enormous quantity to England and her colonies, to Russia, and to the far East. They export a second quality to the French West Indies, Brazil, and Chili. The 25,000 cabinet makers in the Faubourg St. Antoine pretend that no country can compete with them in the form and delicacy of the articles manufactured by them, the suitableness of each part for the purpose for which it is intended, the excellence of the sculpture, the care with which they avoid every useless ornament, of great expense but of doubtful taste, with which the produce of other countries is overloaded. They assert, moreover, that the English artists have for some time past engaged many of their best hands, and that at this moment such tools as are used in Paris are made here to be exported to London. Turkey stands first in the list of customers for the produce of the Faubourg St. Antoine; next comes Brazil, and the United Kingdom third; Russia, Switzerland, Germany, the Spanish colonies, Spain, North America, and Egypt follow in succession. These various countries absorb one-third of the produce of the Faubourg, which is estimated at 30,000,000f. annually. The paper-stainers who have fixed their head-quarters in the same industrial quarter, are known for the great taste and richness of their patterns. The value of their exports, estimated at 5,000,000f. annually, has doubled within the last 10 years. Although the number of pianos manufactured in England and Germany far exceeds those produced in France, the upright pianos exported from France exceed those from either England or Germany. In the manufacture of ribands, of which the value produced throughout France is estimated at 130,000,000f. annually, Paris comes after St. Etienne and St. Chamond. The Paris merchants, however, export a considerable portion of the produce of those towns, as well as that of Nimes and Lyons, to Great Britain, Germany, and North America. The export of ready-made clothes from France, which commenced about 20 years ago, has reached 80,000,000f. annually, of which one-fifth consists of old clothes exported by three houses who confine themselves to that trade. The principal markets for the sale of ready-made clothes are found in Algeria, Belgium, Germany, Switzerland, and Italy. The weather has, of course, much influence on the trade of Paris. Merchants and shopkeepers say that their receipts have not been so good since the present mild weather has set in as during the cold weather last month. All the small shopkeepers and hawkers who depend for a living on their sales on New Year's Day are looking forward to that period with some anxiety."

NATIONAL EXHIBITION IN TURKEY.

The following notice has been issued by the Turkish Government:—

A National Exhibition is to be opened at Constantinople on the 1st Ramazan (20th February, 1863), for three months.

Although reserved exclusively for the products of the soil and industry of the country, nevertheless agricultural and industrial machines and implements, for practical use, from foreign manufactories, will be admitted.

Manufacturers wishing to exhibit such articles will enjoy the benefit of a remission of the Customs duties.

It is well understood that the admission of foreign products will be limited to this sole category, and that a manufacturer cannot send more than one article of the same kind.

Exhibitors must, in the first place, send to the Imperial Ottoman Embassy, or to a consulate of the Sublime Porte, a duplicate list of the articles they wish to exhibit, stating the quality, quantity, and necessary dimensions, so that places may be reserved for them

The articles above mentioned, which, having been exhibited, shall not have been sold on the exhibitors' account, will not enjoy any other advantage on the part of the Imperial Government than the exemption from Customs duties.

METROPOLITAN ASSOCIATION FOR PROMOTING THE EDUCATION OF ADULTS.

The report of the preliminary meeting held on the 8th ult., for the formation of this Association, appeared in the *Journal* for the 18th of November. Since that time, frequent meetings of the Provisional Committee have been held, and the Association has been received into union with the Society of Arts. On Saturday, the 13th inst., a general meeting of the Association took place, when the proceedings of the Provisional Committee were confirmed, and the appointment of officers was made as follows:—

VICE-PRESIDENTS.

THE MARQUIS OF SALISBURY, K.G.
EARL GRANVILLE, K.G.
VISCOUNT ENFIELD, M.P.
THE LORD BISHOP OF LONDON.
THE LORD BISHOP OF WINCHESTER.
SIR W. PAGE WOOD, VICE-CHANCELLOR.
SIR WALTER JAMES, BART.
SIR J. P. KAY SHUTTLEWORTH, BART.
SIR THOMAS PHILLIPS.
THE VENERABLE ARCHDEACON SINCLAIR.
HARRY CHESTER.
H. SEYMOUR TREMENHEERE.
WILLIAM COTTON.
REV. F. C. COOK, H.M. Inspector of Schools.

The following circular has been issued to the metropolitan clergy, to many employers of labour, and others interested in education: —

19, John-street, Adelphi, W.C.

SIR,—We have the honour to enclose, for your information, a report of the proceedings of a public meeting held on the 8th of November, 1862, under the presidency of Vice-Chancellor Sir W. Page Wood.

In that report you will find fully detailed the aims and purposes of the Association, and the plans which it proposes to adopt. But we desire especially to invite your attention to the following points:—

Mechanics' Institutions, Evening Schools, Adult Classes, Working Men's Associations, and Mutual Improvement Societies abound in the metropolis. They are, however, for the most part feeble and inefficient; their conductors need sympathy and assistance; and their members are without inducement to engage in systematic reading, or to avail themselves of the advantages which classes and libraries afford.

The Examinations carried on by the Society of Arts are designed to meet the latter difficulty. The Elementary, or Preparatory Examinations, which are held in the various districts, under the Local Boards, are well adapted to test the thoroughness of the elementary instruction given in the day or evening school. In the advanced examinations, which are conducted by examiners appointed by the Society of Arts—men of the highest eminence in their respective departments—are included all the branches of knowledge from which working men can derive improvement in their callings, or intelligent employment for their leisure.

This scheme of examinations has been warmly welcomed by the working classes wherever it has been brought within their reach. The number of candidates presenting themselves has steadily increased year by year; and in 1862 the examinations were held by 81 Local Boards, 2 of which were in Ireland, 6 in Scotland, and 73 in England. The prizes and certificates which the Society awards have a recognised value among the employers of labour, and have given a stimulus to many thousands of working men in their efforts for self-improvement; but from London and the neighbourhood the number of candidates has hitherto been disproportionately small.

It is a primary object of the Metropolitan Association to bring this scheme under the the notice of the working classes of London, and to make its advantages better known and estimated among them. The Committee hope to accomplish this end:—

(1.) By encouraging the establishment of evening schools and Institutions where they are needed, and by promoting the efficiency of those which already exist.

(2.) By holding public meetings for the explanation of the system of Examinations.

(3.) By establishing in every district in the Metropolis Local Boards, or Sub-Committees, through whose agency the various examinations may be brought within the reach of the working men, who cannot be expected to seek them at a distance.

(4.) By offering special prizes to those candidates of either sex who, having presented themselves from schools or Institutes affiliated to the Association, shall be successful at the Elementary Examinations.

It is to be hoped also that the Association will be able to encourage physical and industrial training among adults; and, by means of readings and lectures, to promote their innocent recreation.

In these undertakings the Committee would thankfully welcome your help as a donor, annual subscriber, or fellow worker; and they now request permission to add your name to the list of members. They will be glad if you will place them in communication with any evening school, or adult class, in which you may be interested; or if in any way you will give them the advantage of your sympathy and support.

Mr. Sales, the Secretary of the Asssciation, will afford any further information you may desire, and is authorised to receive subscriptions and the names of members. Subscriptions may also be paid to the Treasurer, at Messrs. Hoare's Bank, Fleet-street.

We are, Sir,
Your faithful servants,
JOSEPH WALLIS, } *Hon. Secs.*
J. G. FITCH, }

December, 1862.

The support of all those interested in the advancement of education is invited.

Home Correspondence.

MR. TAYLOR'S PAPER ON LABOURERS' COTTAGES.

SIR,—When presiding, on Wednesday last, at the reading and discussion of Mr. Taylor's paper "on the construction of labourers' cottages," &c., I stated that Mr. Peabody had directed his munificent donation of £150,000 to be devoted to similar objects. Having since entertained doubts on this point, I have conferred with that gentleman, and learn from him that, though he speaks in his letter to the trustees of the fund, of the application of the money, "or a portion of it, to the construction of such improved dwellings for the poor of London, as may combine in the utmost possible degree the essentials of healthfulness, comfort, social enjoyment, and economy," he by no means intended to limit them to this precise field of operation. On the contrary, he left his trustees quite at liberty to choose any mode or modes of giving the most substantial effect to his wishes, subject only to the wise provision that no "influences calculated to impart to it or them a character either sectarian as regards religion, or exclusive in relation to local or party politics," should at any time be permitted to operate.

I have reason to know that these gentlemen sympathise largely with Mr. Peabody in the foregoing suggestion.

I am, &c.,
THOS. WINKWORTH.

Gresham Club, Dec. 17, 1862.

SIR,—The paper read on Wednesday evening last, together with the discussion thereupon, give a very poor

estimate of our capabilities in this line, and scarcely touch upon some of the real difficulties of the case, the apparent object being to cause an impression to be made upon the public mind that none but patented articles should be used in building cottages and tenements for the industrial classes, and that we must, in future, entirely abandon the old fashioned materials of good bricks and mortar, once supposed to be both the cheapest and most essential ingredients required for house building.

The foremost difficulty in the way is that of ground rent, which must, by some means or other, be entirely got rid of before we can expect to have substantial buildings, either for rich or poor, for every owner of a house or cottage ought to be the freeholder of the land it stands upon. Ground rent is the primary cause of the wretched courts and alleys with which our towns and cities are so much infested, as well as of the filthy pigsties, designated labourers' cottages, spread broadcast over the rural districts. Rich and noble owners of land in towns and cities will not deprive themselves of a large portion of their revenues derived from back-slum settlements, for the substantial reason that, in consequence of the fearful density of the inhabitants, such tenements yield, in the aggregate, a much larger rental than handsome rows of good houses, occupying the same amount of ground.

An ingenious plan has, of late, been devised, in order to overcome, in some measure, the great difficulty of exorbitant ground rents. It is to pack about twenty families, or an average of one hundred human beings, one upon the other, like herrings in a barrel, upon a plot of ground fifty feet by thirty, whereby each individual receives, as his allotment, only fifteen square feet of the earth's surface, or five feet by three, from which has to be deducted all the passages, staircases, and other unoccupied portions. Such an arrangement for the accommodation of the industrial and poorer classes is equally dishonest and improvident.

Another difficulty lies with the existing patent laws, which almost preclude the possibility of making use of any non-patented materials, for no exclusive privilege can be obtained for the manufacture of such common things as bricks and mortar, however good, and they are therefore produced at the lowest standard of quality that will command a sale. If bricks are to be kept in stock any time, it is found necessary to house them, for fear of their melting away, and fine red bricks for facings are generally so soft that they are merely rubbed gently one upon the other to make them fit into their intended situations.

The result is self-evident, that when we wish to construct damp-proof buildings, recourse must be had to some patented material or manufacture, and that if it were not for the patent laws, common bricks would be made damp-proof, as well as lime mortar, much superior to many patent cements, which are most extensively adulterated, and, though they harden, never adhere. There is clay in abundance all over this country fit for making non-absorbent bricks, but unless some trickery be introduced into the manufacture, so as to acquire exclusive rights, no one will take up the business. Again, if common lime be found fit for making damp-proof concrete, surely there can be no difficulty in making damp-proof mortar.

It is, however, of little consequence, as nobody in this country builds for a permanence, and it cannot be expected that any unnecessary expense will be incurred for the purpose of obtaining good and durable materials. The worst bricks and poor lime are the rule, and the mortar is made up of the rubbish out of the foundations, so that long before the lease is run out, the house, or cottage, as the case may be, has to be partially rebuilt; and our homes are perpetually damp, because the walls are built of sponge.

I have formerly explained in this *Journal* that all over Italy water-proof walling may be seen built with the common bricks and mortar of the country, but good of their kind. I have myself had vats built of four-inch brickwork, of the capacity of over one thousand cubic feet, which never exhibit the slightest damp outside from the water or liquor contained within.

There is abundance of limestone in many parts of this country, which, with good sand, naturally forms proof mortar, but nobody will use it because it is not a patented article.

The design also presents another obstacle, for we apply most erroneously to first-rate architects, or have recourse to premiums and rewards; whereas the designs, to be appropriate, must be made by persons of their own class, who are well acquainted with their peculiar habits and customs; and the best model cottages will be produced by laying down certain conditions before any intelligent country builder—for they, as a body, are no way inferior to their London brethren, and for rural works are much superior—and leaving him free to carry out his plan in his own way.

Palatial residences for the poor, as now building in London, are outrageously inconsistent; every room, not a passage, of a complicated double *trapeze* form, with no proper place for a bedstead; patent fireplaces in every out-of-the-way corner; washhouse *inconveniences*, 6 feet by 4, boiler and patent stove-grate included; no outlet of any kind except the front door, up four pair of stairs, and patent air-traps, or rat-holes, running through the entire building. Such monstrosities are purely the offspring of the patent laws and patentees, of whom not one in a hundred make a cent by their patent-right privileges, though their lawyers may, perhaps, to some considerable extent. The proposal to make the poor wife bleach her linen on a London house-top, seems to be most absurd.

A distinction must of course be made in building cottages for the industrial and the poorer classes in towns and the country. With the latter the rule is, single or double cottages, or rows of cottages, with each a small separate plot of garden-ground; but town residences for the poor should be built on the plan of small pieces of towns, complete of themselves, with proper streets, churches, chapels, and institution or club buildings, and each tenement having its own separate yard and common drying-ground. In no case, however, should these tenements be more than two stories high, because the labour of going up high flights is a terrible and profitless waste of human strength.

If it be objected that the high rate of ground-rents in towns and cities forbids, let an end be put to ground-rents by the purchase of the land, not out of rates, but with public moneys, for the country at large would be greatly benefited, and the parish rates much diminished, by lodging the industrial and pocrer classes in simple but commodious and healthy buildings.

I need not allude to another endless source of evil—the inequality of rating in different parishes. I contend, with Mr. Stones, that our poor belong to no parish, and that the rating to the poor should be the same in every parish in the kingdom. I am, &c.,

HENRY W. REVELEY.

Poole, December 15, 1862.

SIR,—Having read Mr. Taylor's paper with considerable interest, and the account of the discussion which followed on Wednesday evening last, reported in your *Journal* of Friday last, more particularly respecting the cost of erecting labourers' cottages, allow me to forward you the following particulars of a pair of cottages which were erected from my drawings and designs about a year since, at Orpington, for £180 per pair.

These cottages each contain four rooms:—A kitchen or living room, 14 feet by 12 feet; scullery, and two bedrooms—the larger room 14 feet by 12 feet—and lobby porch between the living room and staircase.

There is in the scullery a larder, sink, pump, copper, closet for coals or wood; in the principal room a cupboard, dresser, and range with oven and boiler.

The roof over the cottages runs from end to end, and is V-shaped and of cruciform plan, there being a gable in the centre, higher than the other roof, with two chimney stacks on each side. These roofs are covered with slates.

The design is of a picturesque Gothic style, the walls constructed of variously-coloured bricks. To avoid the upward ascent of damp from the earth, a layer of slates, bedded in cement, has been introduced a few inches above the surface of the ground. I am, &c.,

JAMES G. STAPELTON, JUN.

62, Cannon street, City, E.C.,
December 15, 1862.

Proceedings of Institutions.

ASHFORD, SOUTH-EASTERN RAILWAY MECHANICS' INSTITUTION.—The report of the Council for the half-year ending September 30th, 1862, being the thirtieth, says that the funds of the Institution are in a very satisfactory state, there being a balance in its favour—to enable it to continue its system of class instruction, further spoken of in another part of this report, and to add new and useful works to the library—of nearly £75 ; the sum of £64 2s. 9d. having been added thereto by the workmen's excursion to London to view the International Exhibition, kindly granted by the directors of the South-Eastern Railway Company, to whom, and all who have assisted to promote the prosperity of the Institution, the Council tender their sincere thanks. The number of members has fallen during the half-year from 180 to 164, being, however, four more than at this time last year; and considering that the Council refused to admit as members persons unemployed by the Railway Company, until the question whether such ought to be permitted to join the Institution had been settled, which was done towards the month of August, and in their favour, but limiting their voice in the Council to one representative, and that it has been customary for the number of members to decrease during the summer half-year, then the present number relatively is not unsatisfactory; but when the number of persons employed in the works and the advantages offered by the Institution are taken into account, we might reasonably expect to see it considerably increased. At the last half-yearly meeting it was resolved, that a general meeting of the members should be called for the purpose of considering the propriety of revising the rules of the Institution. The meeting that assembled in accordance with that resolution unanimously declared that the rules required amending, and appointed a Committee of six to make such alterations in them as they might think requisite. The alterations made by this Committee were posted in the reading-room for one month, together with a notice convening a special meeting of the members on August 27th, to which the Committee submitted their amended rules, when, with a few alterations, they were adopted and made the laws of the Institution. During the half-year the Council appointed two of their body to assist the Librarian in making a thorough inspection of the library, when such books as were found in a dirty and tattered condition were removed and new ones substituted, and a few that had been lost were replaced. Several magazines and other periodicals taken in monthly parts, have been bound up and placed in the library, and the Council contemplate a further addition very shortly. The number of volumes now in the library is 1,179. There has been about the usual attendance in the reading-room, and no alteration has been made in the papers laid on the table. The Council, deeming it advisable that the instruction by classes (which of late years has formed a prominent feature in the working of the Institution), should commence as near the beginning of the ensuing half-year as possible, are endeavouring to form classes in arithmetic, English grammar (including orthography and composition), mechanical and free-hand drawing, separately, and under different teachers, and French, each class to consist of not less than eight members, who will be required to pay 1s. 6d. per quarter, in advance, to join the class in mechanical drawing, and 1s. 6d. per quarter to join either of the others. The Council have also made arrangements for the members to attend, gratis, the lectures and entertainments given in connection with the Ashford Mechanics' Institution during the winter. The Council are pleased to report that five of the six members who underwent the Society of Arts' Examination, last May, were successful. To these the Council of the Institution have awarded prizes of books, according to the scale agreed upon at the corresponding half-yearly meeting last year. The chess club recommenced holding its weekly meetings on the first Monday of September, and the attendance thus far leads to the supposition that it will equal, if not surpass, any season since its establishment.

MEETING FOR THE ENSUING WEEK.

SAT..... ..Royal Institution, 3. Professor Frankland, F.R.S., "On Air and Water." (Juvenile Lectures.)

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

Dated 25th November, 1862.

3158. T. Robertshaw and L. Robertshaw, Bradford—Imp. in the manufacture of textile fabrics, technically called "Moreens."
3164. G. Ranson, Eccleston, Lancashire—Imp. in apparatus for preparing clay for brick making and other purposes.

Dated 26th November, 1862.

3168. T. Fletcher, Rochdale—Imp. in the construction of rollers, cans, spools, and bobbins, and in the machinery employed therein.
3170. J. Steinthal, Abbey Hey Works, Gorton, near Manchester—An improved moulder's blacking.

Dated 27th November, 1862.

3178. F. W. Hartley, 55, Millbank-street, Westminster—Improved means of obtaining certain products resulting from the manufacture and purification of coal gas.
3180. W. T. Rowlett, Leicester—Imp. in machinery used in producing knit or looped fabrics.
3184. W. Clark, 53, Chancery-lane—Imp. in the preservation of animal and vegetable substances. (A com.)

INVENTION WITH COMPLETE SPECIFICATION FILED.

3198. W. E. Gedge, 11, Wellington-street, Strand—Imp. in the construction of clocks or time-keepers. (A com.)—29th November, 1862.

[*From Gazette December 12th*, 1862.]

Dated 28th July, 1862.

2134. W. Maugham, Prospect-place, Wandsworth-road—Imp. in the manufacture of effervescent beverages.

Dated 8th October, 1862.

2720. M. A. F. Mennons, 24, Rue du Mont Thabor, Paris—Imp. in self-inking hand stamps. (A com.)

Dated 13th November, 1862.

3053. A. Twaddell, Glasgow—Improved arrangements for dressing or sizeing warps.
3057. J. Slack, Manchester—Imp. in nursery swings and cots.
3059. W. E. Gedge, 11, Wellington-street, Strand—An improved machine working by compression and expansion of air. (A com.)
3063. R. A. Brooman, 166, Fleet-street—An improved means or apparatus for shunting trains. (A com.)
3065. C. G. Kopisch, Bishopsgate-street Without—Improved apparatus for propelling, steering, and ventilating vessels.

Dated 14th November, 1862.

3266. E. S. Cathels, Shrewsbury—Imp. in apparatus used in the manufacture of gas.
3067. E. B. Wilson, 5, Parliament-street, Westminster—Imp. in the method of conveying air, steam, gases, and fluids to oscillating or vibrating cylinders and vessels, and in the apparatus employed therein.
3069. S. Roberts, Sheffield—An imp. in frames for containing stoppered bottles and jars.
3071. V. J. Gassaignes, Gavundum, France—Imp. in stereoscopes.

Dated 15th November, 1862.

3073. J. S. Clegg and J. Slater, Oldham—Certain imp. in carding engines.
3075. E. Kirby, Birmingham—A new or improved pulley for tightening the cords of window and other blinds.
3079. E. H. Duru, Poitiers, France—An improved motive power engine.

3081. W. H. James, Old Kent-road—Imp. in steam engines.
3082. J. Wilson, 2, Royal Exchange-buildings—Imp. in hydraulic pumps. (A com.)
3083. G. Gray, Greenwich, Kent—Imp. in the manufacture of wheels.

Dated 17th November, 1862.

3085. C. Binks, Parliament-street, Westminster—Improved methods of obtaining oxygen and chlorine gases.
3087. W. Dobson, Nottingham—Imp. in lace dressing frames employed in the dressing of lace or other fabrics.
3089. W. Williamson, 133, High Holborn—Imp. in washing, wringing, and mangling machines.
3091. G. Richards, Caroline-street, Bedford-square—Imp. in the construction of ordnance and fire-arms, and in the projectiles to be used therewith.

Dated 18th November, 1862.

3093. J. Arbos, Barcelona, Spain—Imp. in generating certain gases for lighting and heating, and in apparatus employed therein.
3095. W. H. Burnett, Margaret-street—Imp. in the mode of working telegraphic lines, and in instruments and apparatus employed for telegraphic purposes.
3097. C. W. Harrison, Lorimer-road, Walworth, Surrey—Imp. in looms for weaving.
3098. C. Neild, Cheadle, Chester, and J. Hopkinson, York-place, Manchester—Imp. in fire alarums and indicators of temperature.
3099. R. Brown, Birmingham—Imp. in warming and ventilating, more especially applicable to buildings, carriages, and ships, and in apparatus to be employed for that purpose.
3101. R. Beck, Peartree-cottage, Upper Holloway—Imp. in reading glasses and magnifiers to be simultaneously used with both eyes.

Dated 19th November, 1862.

3103. L. Lenzberg, 492, Oxford-street—Imp. in the apparatus for raising and lowering Venetian and other blinds.
3107. S. S. Brown, Ellesmere Works, Runcorn, Cheshire—Imp. in the manufacture of elastic fabrics or garments.
3109. R. A. Brooman, 166, Fleet street—Imp. in tubular boilers, condensers, and superheaters. (A com.)
3111. J. B. Edmondson, and J. Carson, Manchester, and J. Blaylock, Carlisle—Imp. in machinery for printing, numbering, and dating railway and other tickets.
3113. G. A. Buchholz, Montague-place, Clapham-road, Surrey—An improved mode of manufacturing semolina and flour, and in apparatus to be employed in such manufacture.

Dated 20th November, 1862.

3114. J. T. Hutchings, Inkermann-terrace, Charlton, Kent—Imp. in the construction of waterproof boot and shoe soles.
3115. J. Jewsbury, Kinver, Staffordshire—An imp. or imps. in machines for raising weights, which imp. or imps. may also be applied to lathes.
3117. G. W. Oldham, Moll Spring, Honley, near Huddersfield—Imp. in preparing and dyeing silk waste, flax, hemp, Indian or China grass, or other similar fibrous substances.
3119. R. A. Brooman, 166, Fleet-street—A method of, and apparatus for, indicating and recording the course of ships and vessels. (A com.)
3121. F. Seiler, 2, Thavies-inn, Holborn—Imp. in motive power engines, and in apparatus for conveying and distributing motive power.

Dated 21st November, 1862.

3125. W. Sinnock, Nicholas-lane—Imp. in the treatment and combination of fibrous and other materials, and in the arrangement of apparatus for manufacturing the same.
3127. J. Townsend, Glasgow—Imp. in damping and preserving vegetable substances, and vegetable and other textile materials and fabrics.
3135. G. G. Sanderson, Park-gate Iron Works, Rotherham—Imp. in armour for fortifications and floating and other batteries.
3137. C. A. Orth, Church-road, De Beauvoir square—Imp. in apparatus for obtaining and applying motive power.
3139. A. Sutton, Rue Boursault, Paris—An improved construction of time indicator for public vehicles and other uses.

Dated 22nd November, 1862.

3141. W. E. Nethersole and C. Buckland, Swansea—Improved safety signals for fire-arm practice.
3143. C. De Bergue, Manchester—Imp. in machinery or apparatus for the manufacture of metal reeds for weaving.
3145. W. Clark, 53, Chancery-lane—Imp. in candle-lamps. (A com.)
3147. J. Webster, Birmingham—Imp. in the construction of burners and blow-pipes.

Dated 24th November, 1862.

3152. J. Barclay, Vulcan Foundry, Kilmarnock—Imp. in the construction and arrangement of rollers to be used in machinery for printing textile materials or fabrics, and in apparatus for drying and finishing the said materials or fabrics.
2153. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in burnishing metal surfaces, and in the machinery or apparatus employed therein.

Dated 25th November, 1862.

3157. J. Moule, 15, Seabright-place Hackney-road—An improved method of deodorizing mineral oils aud hydro-carbons.
3159. A. L. Woolf, Birmingham—A new or improved metallic alloy.
3160. E. Wadsworth, Macclesfield—Imp. in machinery used in the manufacture of certain descriptions of braid.
3163. G. Henderson, 7, Mincing-lane, London—Imp. in steam engines. (A com.)
3165. A. V. Newton, 66, Chancery lane—Imp. in sewing machines. (A com.)
3167. T. M. Elton, St. Luke's Soap Works, Golden-lane, Barbican—Imp. in the manufacture of soap, and in the machinery employed therein.

Dated 26th November, 1862.

3169. J. Aspell, and E. Booth, Middleton, Lancashire—Certain imp. in looms for weaving.
3171. F. Palling, Esher-street, Upper Kennington-lane, Surrey—An improved fountain penholder.
3172. J. F. Foveaux, Strand—Imp. in apparatus for pulverizing or dividing liquids into spray. (A com.)
3173. W. Austin, Furnival's-inn-place, Holborn—An improved material for the manufacture of cartridge cases, applicable also for tubing and various other useful purposes.
3175. A. V. Newton, 66, Chancery-lane—An improved mode of preparing oxide of zinc as a pigment. (A com.)

Dated 28th November, 1862.

3188. J. T. Caird, Greenock—Imp. in steam engines.
3190. F. Boecke, Berlin—Imp. in sewing or uniting fabrics, and in the machinery or apparatus employed therein.
3196. J. Adams, Bridgehouse, Bow, and C. White, King-street, Regent-street—Imp. in apparatus for boiling and evaporating

PATENTS SEALED.

[*From Gazette, December 12th*, 1862.]

December 12th.
1785. S. H. Huntly.
1789. A. W. Makinson.
1808. R. Stansfield & J. Dodgeon.
1816. J. B. T. Detuncq.
1822. J. W. Taylor.
1825. A. Warner.
1832. H. Davenport and J. Davenport.
1849. A. Ripley.
2762. F. G. Grice.

[*From Gazette, December 16th*, 1862.]

December 16th.
1799. J. Warren.
1828. F. E. Schneider and J. Snider, jun.
1831. G. Simpson.
1836. A. F. Maigron.
1837. J. H. Redstone.
1842. T. Wilson.
1846. A. Webster.
1848. R. Cook.
1862. W. Clark.
1871. W. Clark.
1923. W. E. Newton.
1924. E. de Labastida.
1939. W. A. Gilbee.
1951. O. F. Bystrom.
1998. W. Ashton.
2298. M. A. F. Mennons.
2337. G. Davies.
2386. M. A. F. Mennons.
2387. M. A. F. Mennons.
2516. J. Rowell.
2845. H. Wilde.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, December 16th*, 1862.]

December 9th.
2808. I. L. Bell.
2809. J. Chatterton & W. Smith.
2813. R. Emery.
2828. J. R. Johnson and J. S. Atkinson.
2832. S. C. Lister and J. Warburton.
2846. G. Hawksley.
2860. W. H. Harfield.
2876. R. P. Busk & T. Greenwood.
2901. R. S. Howden & E. Thresh.

December 10th.
2814. J. R. Breckon & R. Dixon.
2862. E. P. Holden.

December 11th.
2818. G. C. Watson.

December 12th.
2831. W. Robinson.
2833. J. H. Dickson.
2838. G. Bedson.
2839. G. Leach.

December 13th.
2842. A. Leslie.
2847. W. R. Crocker.
2867. R. Morrison.
2904. J. Ferrabee.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, December 16th*, 1862.]

December 9th.
2785. P. A. le Comte de Fontainemoreau.

December 12th.
2894. J. Murdoch.

LIT OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No.	Date of Registration.	Title.	Name.	Address.
4528	Dec. 1	Columbian Steam Cooking Table	Smith and Wellstood	Glasgow.
4529	,, 4	A Billiard Marker	W. Burroughes ... ... / F. Watts	Soho-square, W.